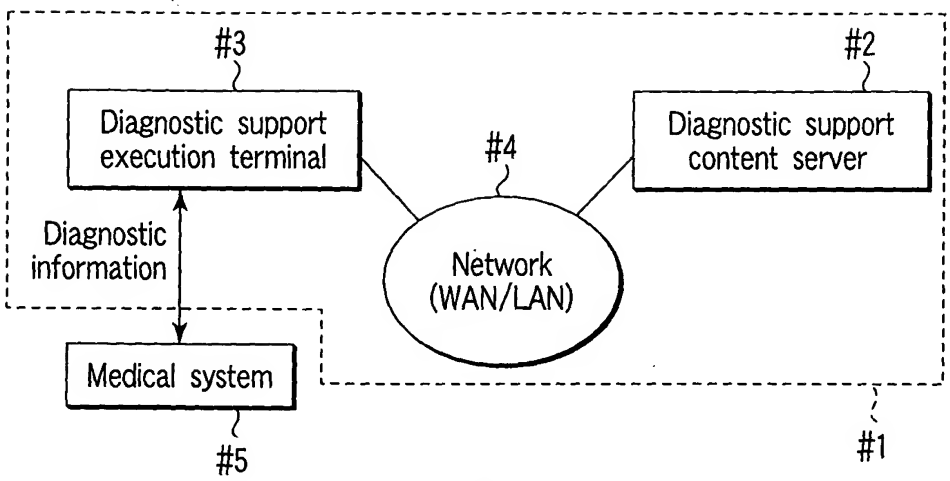

#3
Diagnostic support execution terminal
#2
Diagnostic support content server
#4
Network (WAN/LAN)
Diagnostic information
Medical system
#5
#1

FIG. 1

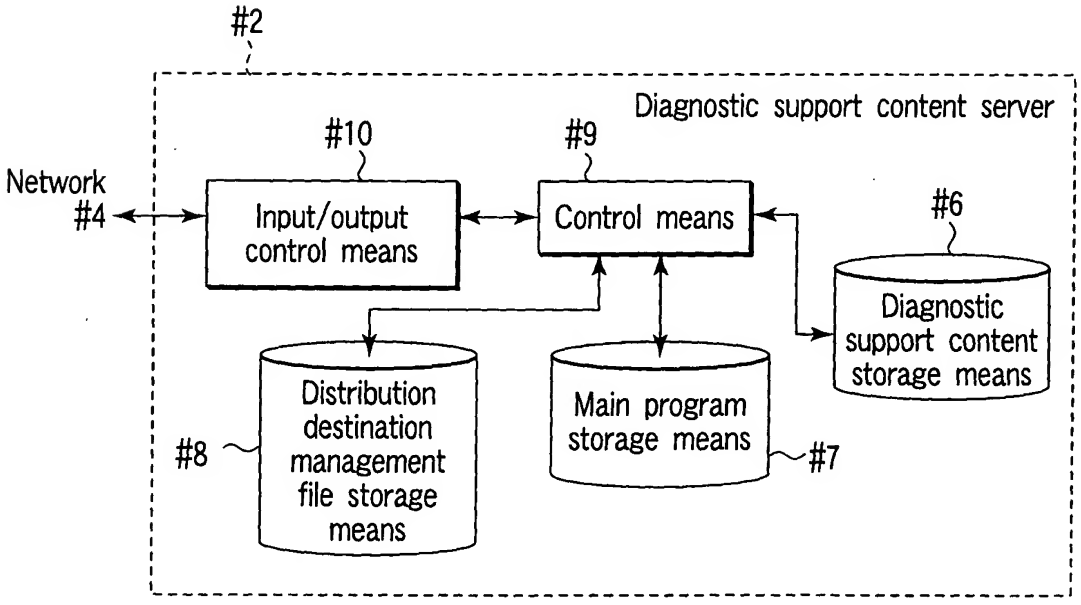

#2
Diagnostic support content server
#10
#9
Network #4
Input/output control means
Control means
#6
Diagnostic support content storage means
Distribution destination management file storage means
#8
Main program storage means
#7

FIG. 2

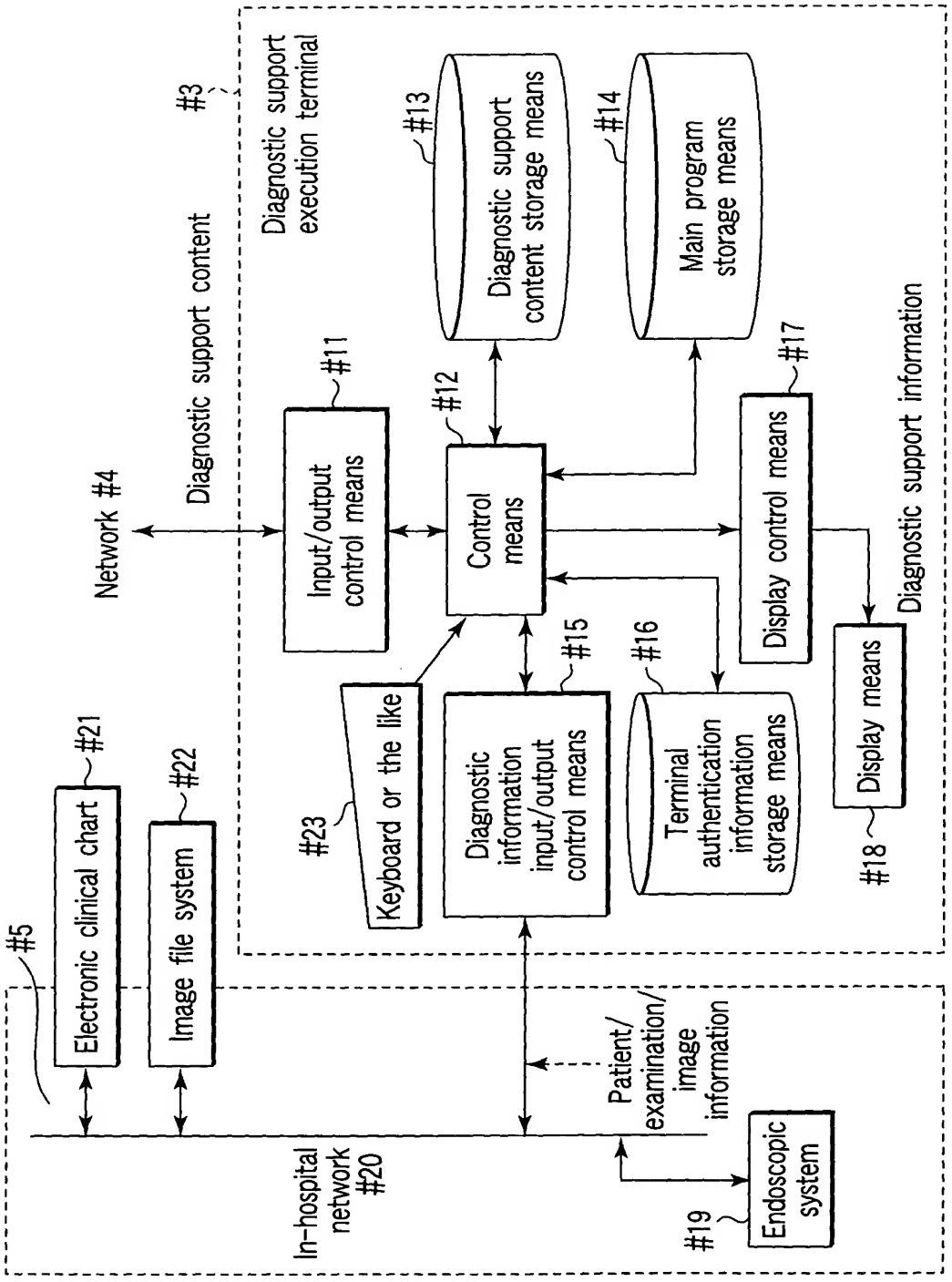

#3
Diagnostic support execution terminal
Diagnostic support content
Network #4
#11
Input/output control means
#12
Control means
#13
Diagnostic support content storage means
#14
Main program storage means
#17
Display control means
Diagnostic support information
#15
Diagnostic information input/output control means
#16
Terminal authentication information storage means
#18
Display means
#23
Keyboard or the like
#5
#21
Electronic clinical chart
#22
Image file system
Patient/ examination/ image information
In-hospital network #20
#19
Endoscopic system

FIG. 3

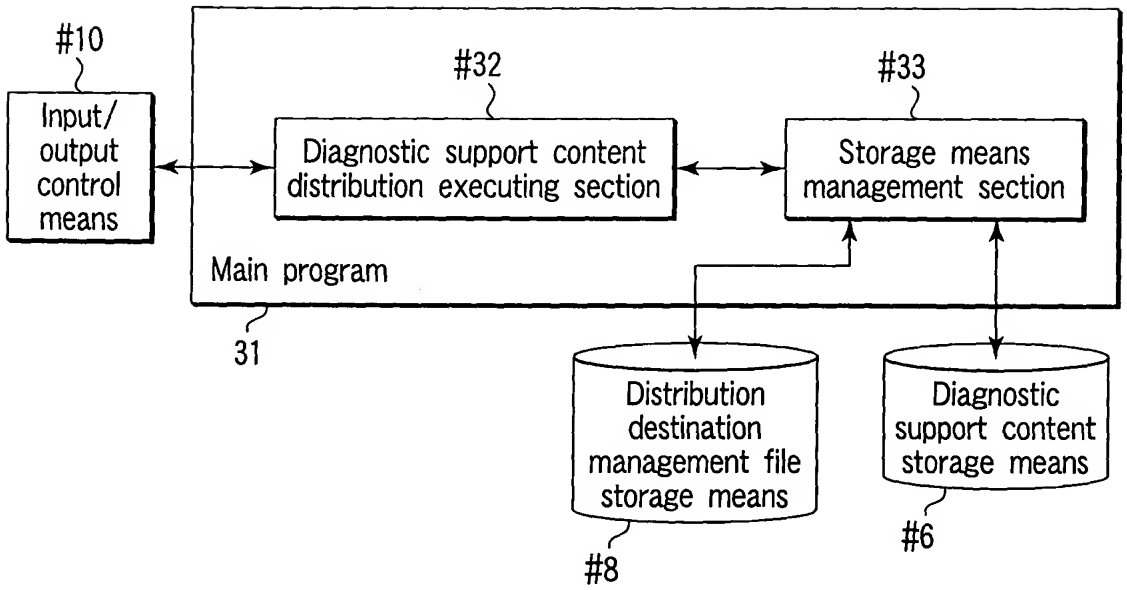

#10
Input/ output control means
#32
Diagnostic support content distribution executing section
#33
Storage means management section
Main program
31
Distribution destination management file storage means
#8
Diagnostic support content storage means
#6

FIG. 4

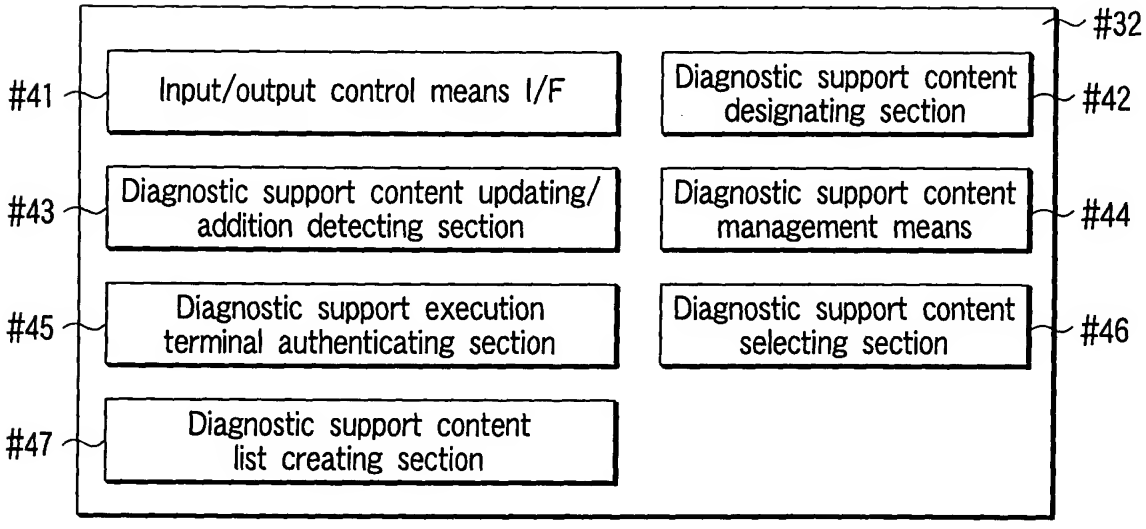

#32
#41
Input/output control means I/F
Diagnostic support content designating section
#42
#43
Diagnostic support content updating/ addition detecting section
Diagnostic support content management means
#44
#45
Diagnostic support execution terminal authenticating section
Diagnostic support content selecting section
#46
#47
Diagnostic support content list creating section

FIG. 5

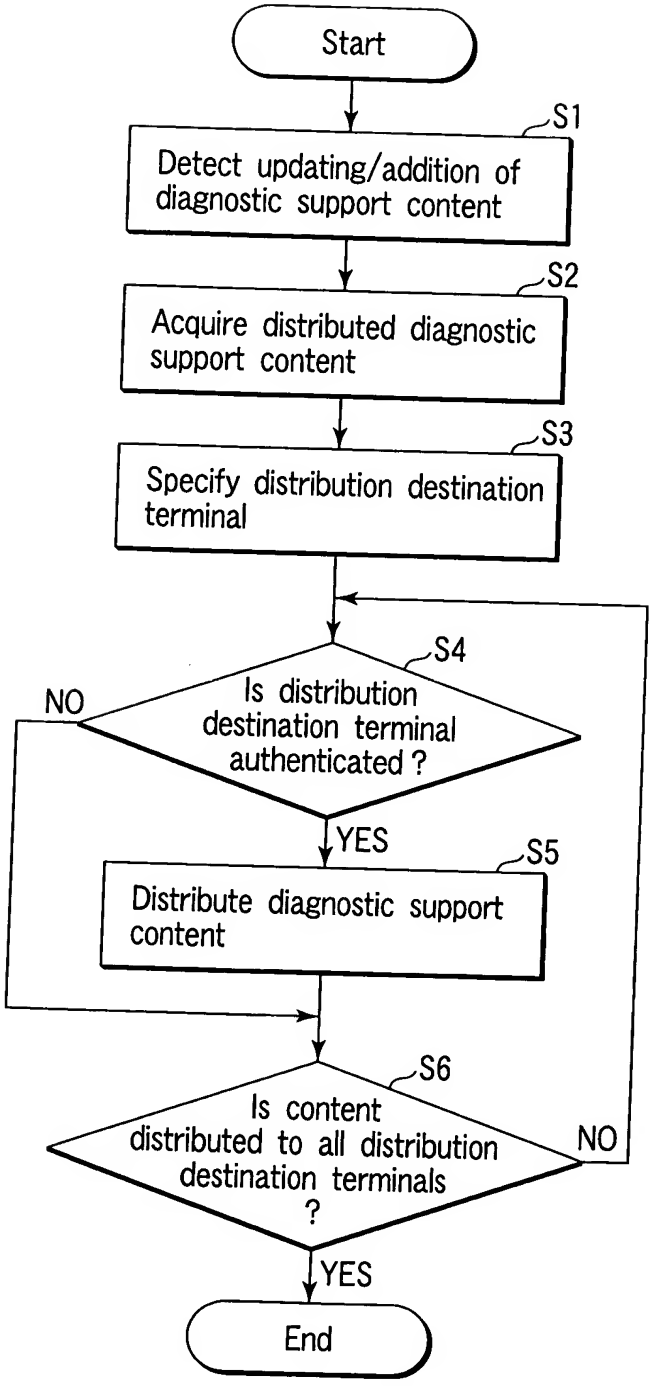

Start
S1
Detect updating/addition of diagnostic support content
S2
Acquire distributed diagnostic support content
S3
Specify distribution destination terminal
S4
Is distribution destination terminal authenticated ?
NO
YES
S5
Distribute diagnostic support content
S6
Is content distributed to all distribution destination terminals ?
NO
YES
End

FIG. 6

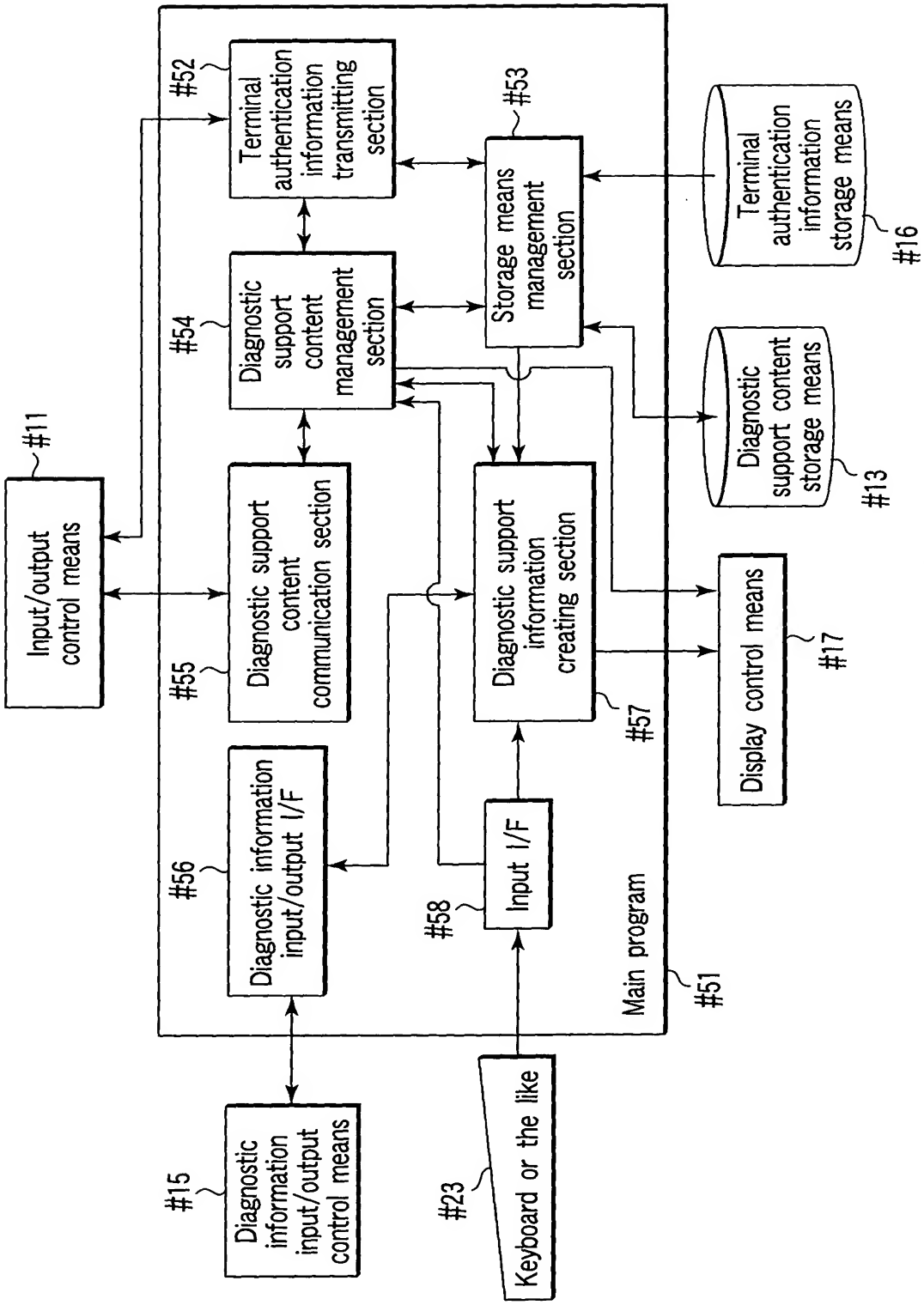

Input/output control means
#11
Diagnostic support content communication section
#55
Diagnostic support content management section
#54
Terminal authentication information transmitting section
#52
Storage means management section
#53
Terminal authentication information storage means
#16
Diagnostic support content storage means
#13
Diagnostic support information creating section
#57
Display control means
#17
Diagnostic information input/output I/F
#56
Input I/F
#58
Main program
#51
Diagnostic information input/output control means
#15
Keyboard or the like
#23

FIG. 7

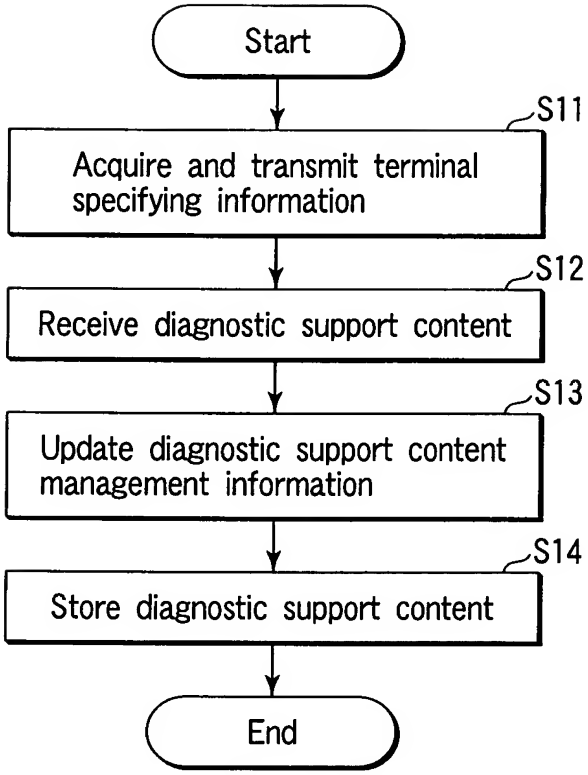

Start
S11
Acquire and transmit terminal specifying information
S12
Receive diagnostic support content
S13
Update diagnostic support content management information
S14
Store diagnostic support content
End

FIG. 8

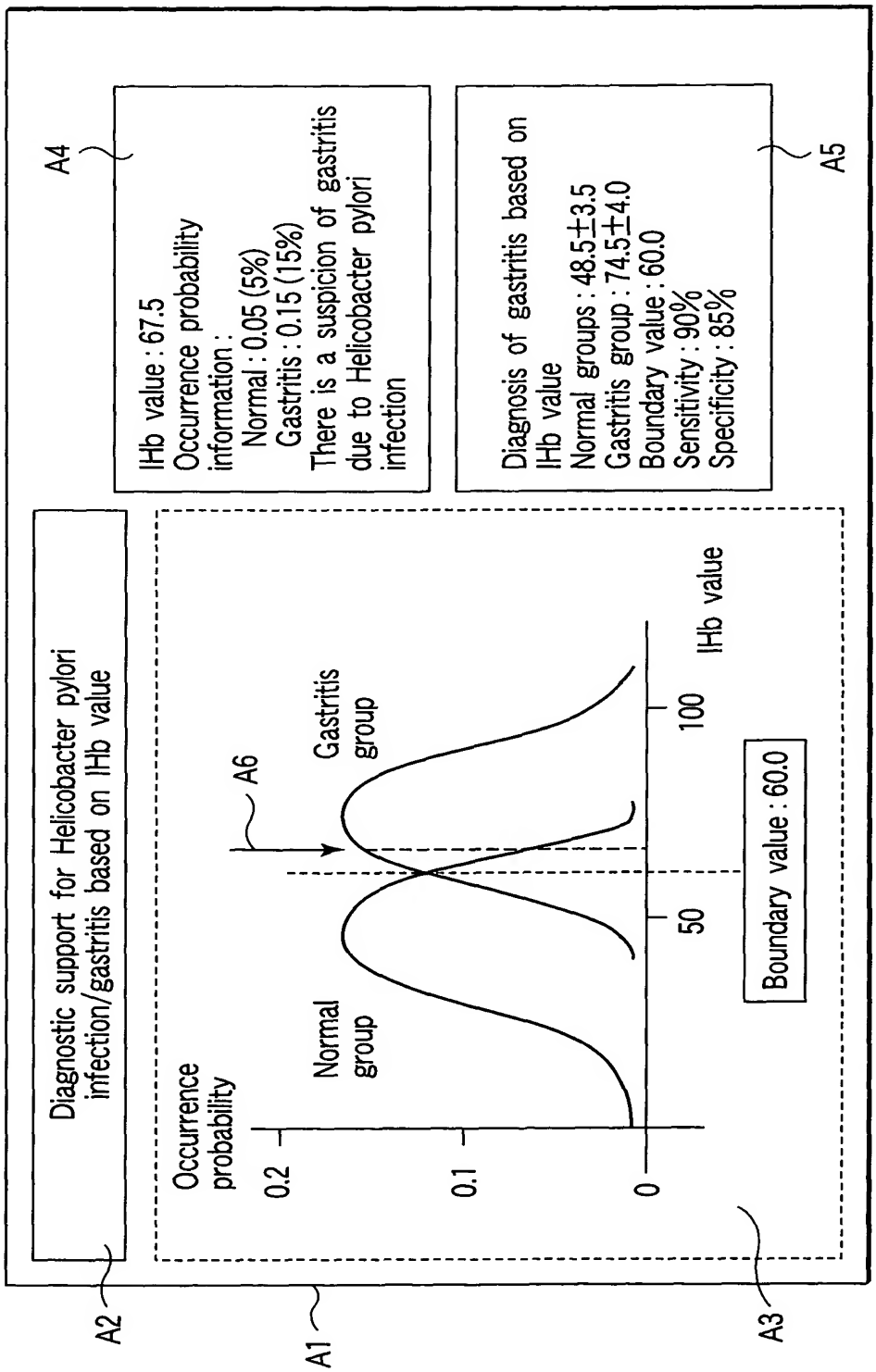

A1
A2
A3
A4
A5
A6
Diagnostic support for Helicobacter pylori infection/gastritis based on IHb value
IHb value : 67.5
Occurrence probability information :
Normal : 0.05 (5%)
Gastritis : 0.15 (15%)
There is a suspicion of gastritis due to Helicobacter pylori infection
Diagnosis of gastritis based on IHb value
Normal groups : 48.5±3.5
Gastritis group : 74.5±4.0
Boundary value : 60.0
Sensitivity : 90%
Specificity : 85%
Occurrence probability
0.2
0.1
0
Normal group
Gastritis group
50
100
IHb value
Boundary value : 60.0

FIG. 9

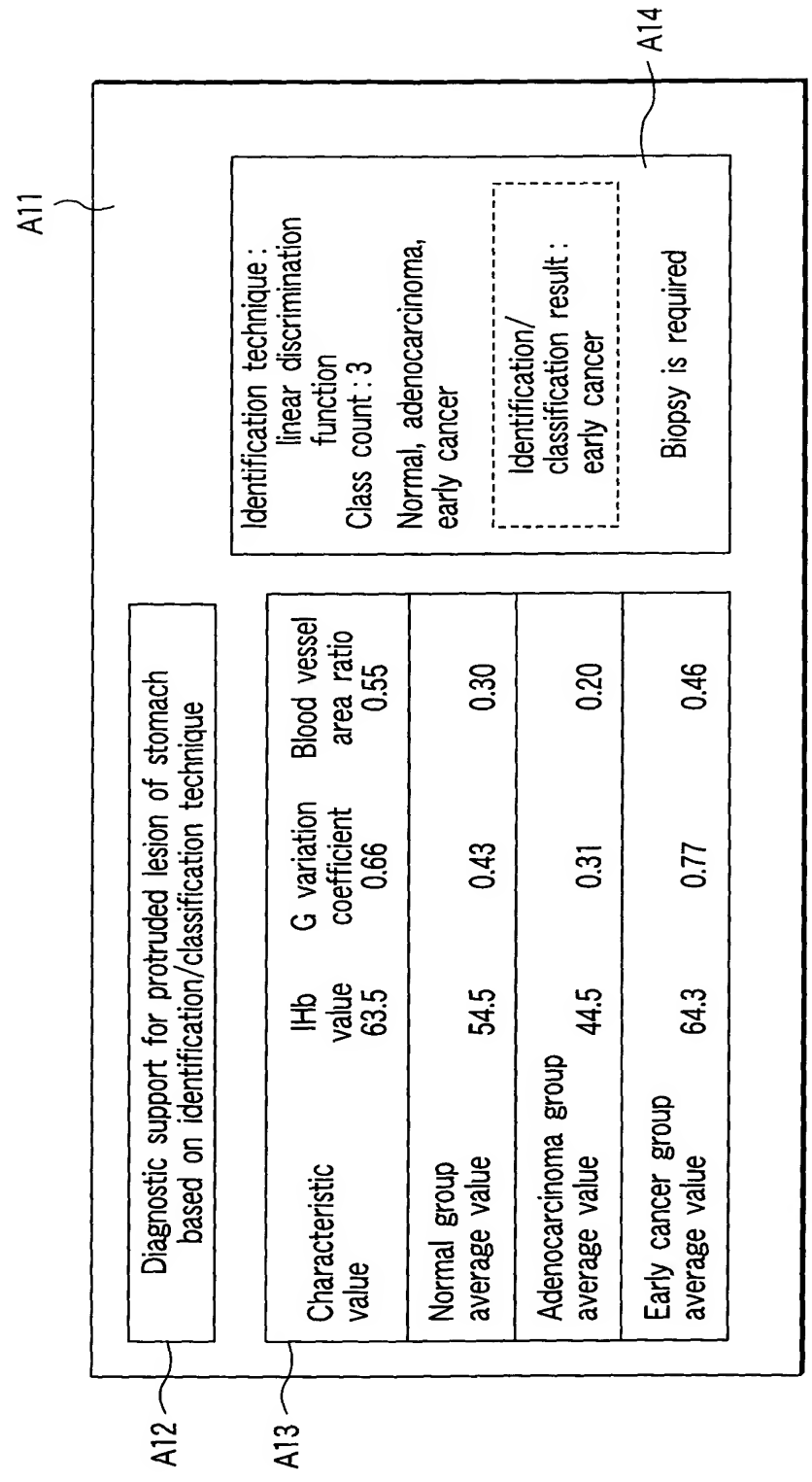

A11
A12
A13
A14
Diagnostic support for protruded lesion of stomach based on identification/classification technique
Identification technique : linear discrimination function
Class count : 3
Normal, adenocarcinoma, early cancer
Identification/ classification result : early cancer
Biopsy is required
Characteristic value
IHb value
G variation coefficient
Blood vessel area ratio
63.5
0.66
0.55
Normal group average value
54.5
0.43
0.30
Adenocarcinoma group average value
44.5
0.31
0.20
Early cancer group average value
64.3
0.77
0.46

FIG. 10

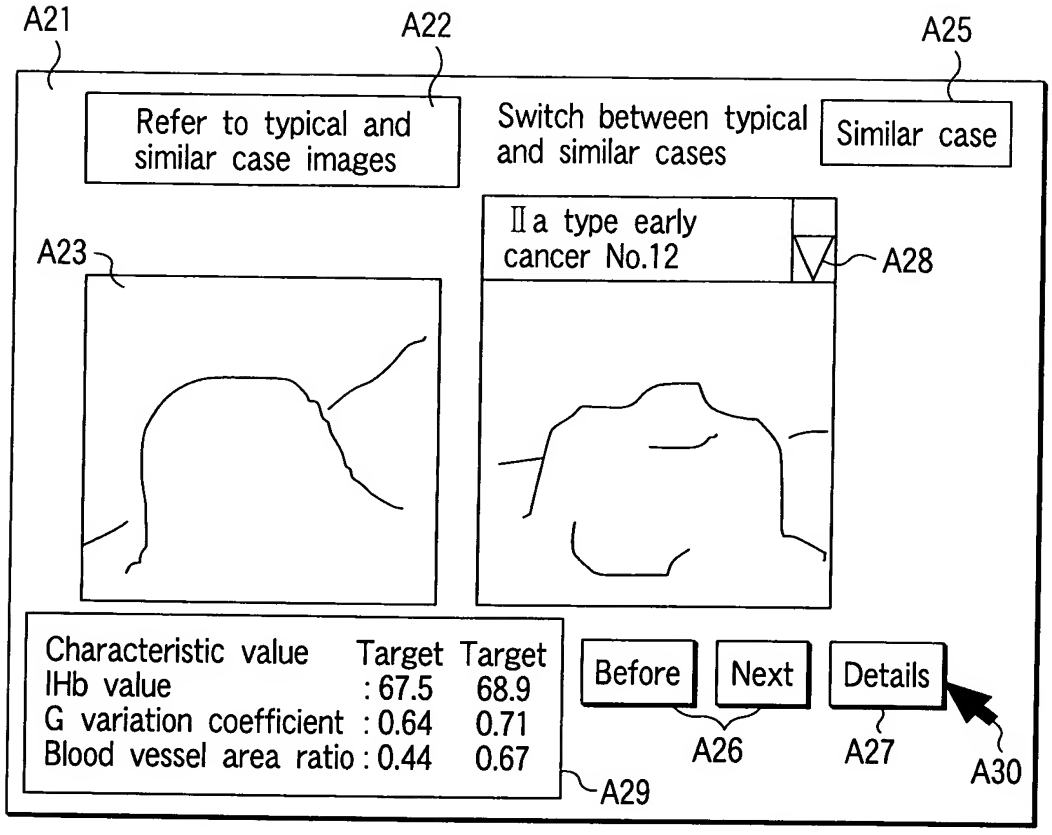

A21
A22
A25
Refer to typical and similar case images
Switch between typical and similar cases
Similar case
A23
Ⅱa type early cancer No.12
A28
Characteristic value Target Target
IHb value : 67.5 68.9
G variation coefficient : 0.64 0.71
Blood vessel area ratio : 0.44 0.67
A29
Before
Next
Details
A26
A27
A30

FIG. 11

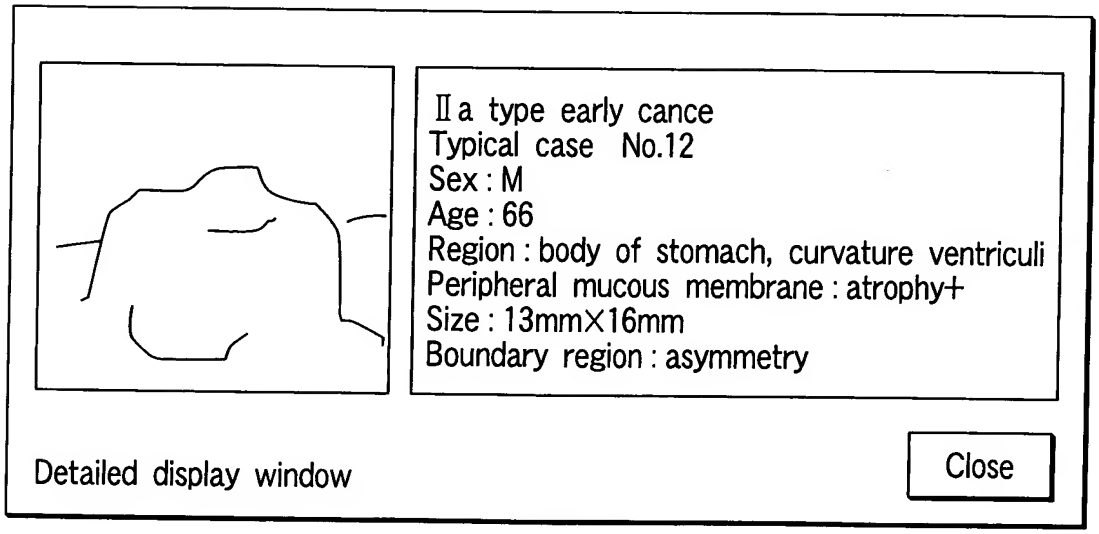

Ⅱa type early cance
Typical case No.12
Sex : M
Age : 66
Region : body of stomach, curvature ventriculi
Peripheral mucous membrane : atrophy+
Size : 13mm×16mm
Boundary region : asymmetry
Detailed display window
Close

FIG. 12

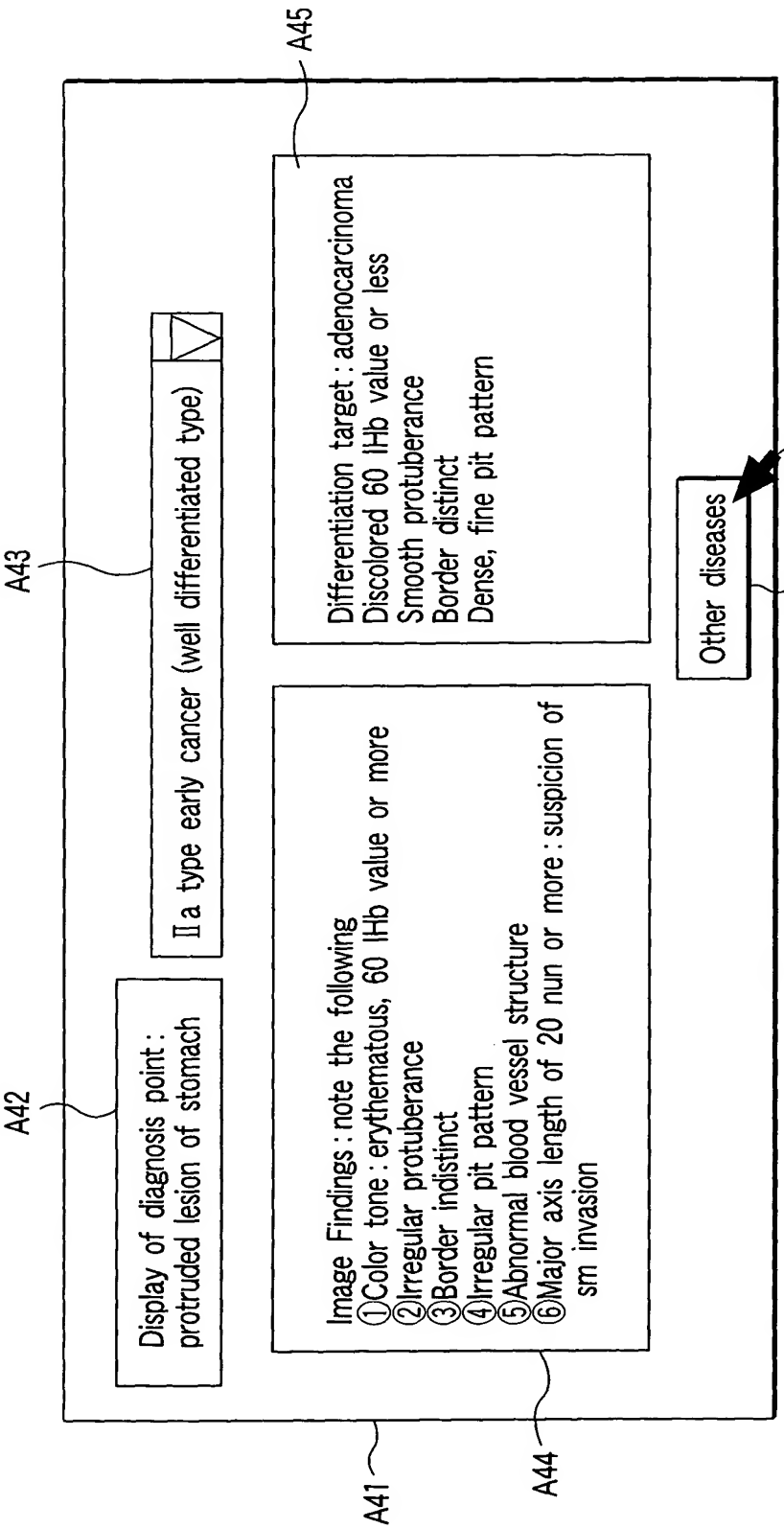

A41
A42
Display of diagnosis point : protruded lesion of stomach
A43
IIa type early cancer (well differentiated type)
A44
Image Findings : note the following
①Color tone : erythematous, 60 IHb value or more
②Irregular protuberance
③Border indistinct
④Irregular pit pattern
⑤Abnormal blood vessel structure
⑥Major axis length of 20 nun or more : suspicion of sm invasion
A45
Differentiation target : adenocarcinoma
Discolored 60 IHb value or less
Smooth protuberance
Border distinct
Dense, fine pit pattern
A46
Other diseases
A47

FIG. 13

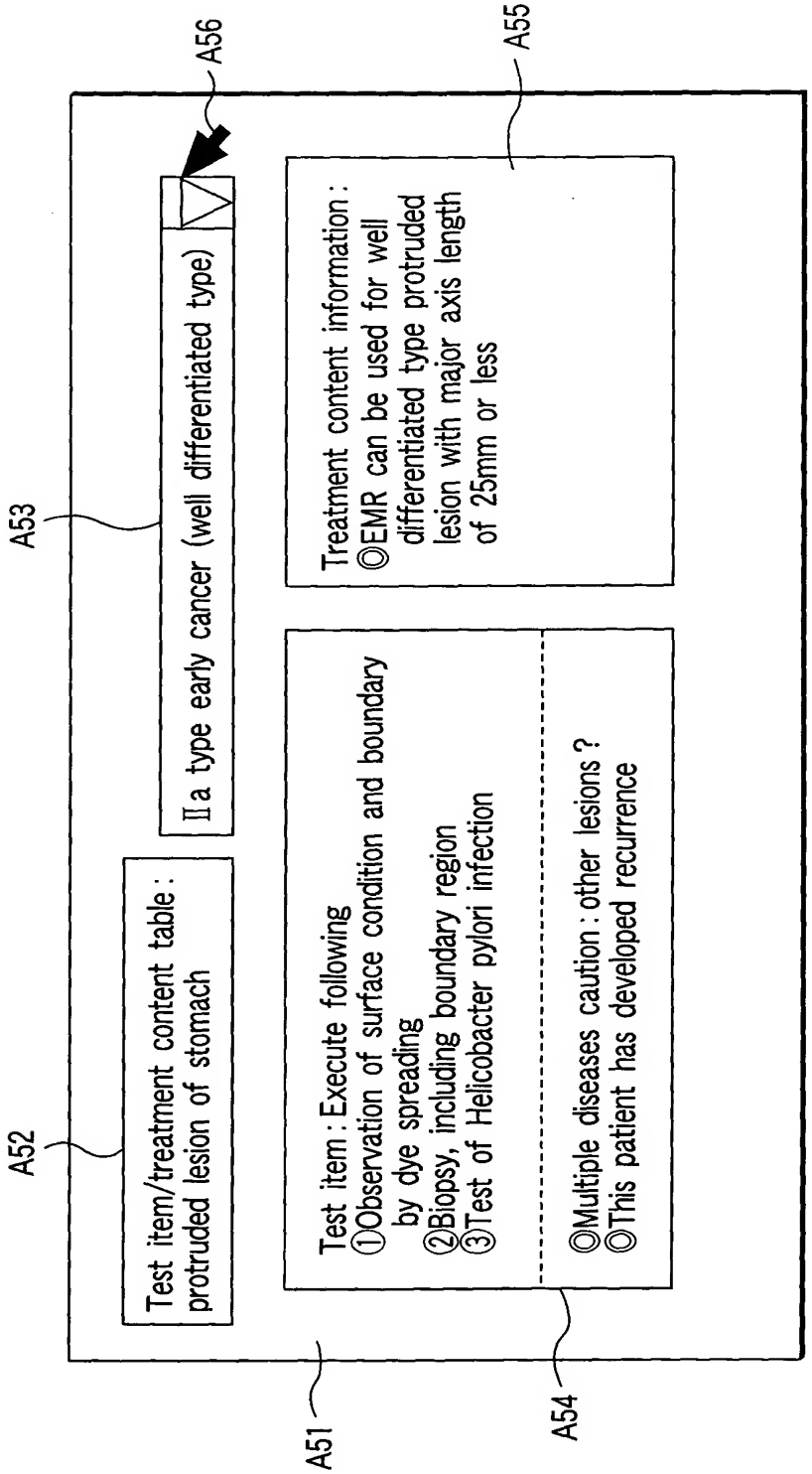

A51
A52
Test item/treatment content table : protruded lesion of stomach
A53
IIa type early cancer (well differentiated type)
A54
Test item : Execute following
①Observation of surface condition and boundary by dye spreading
②Biopsy, including boundary region
③Test of Helicobacter pylori infection
◎Multiple diseases caution : other lesions ?
◎This patient has developed recurrence
A55
Treatment content information :
◎EMR can be used for well differentiated type protruded lesion with major axis length of 25mm or less
A56

FIG. 14

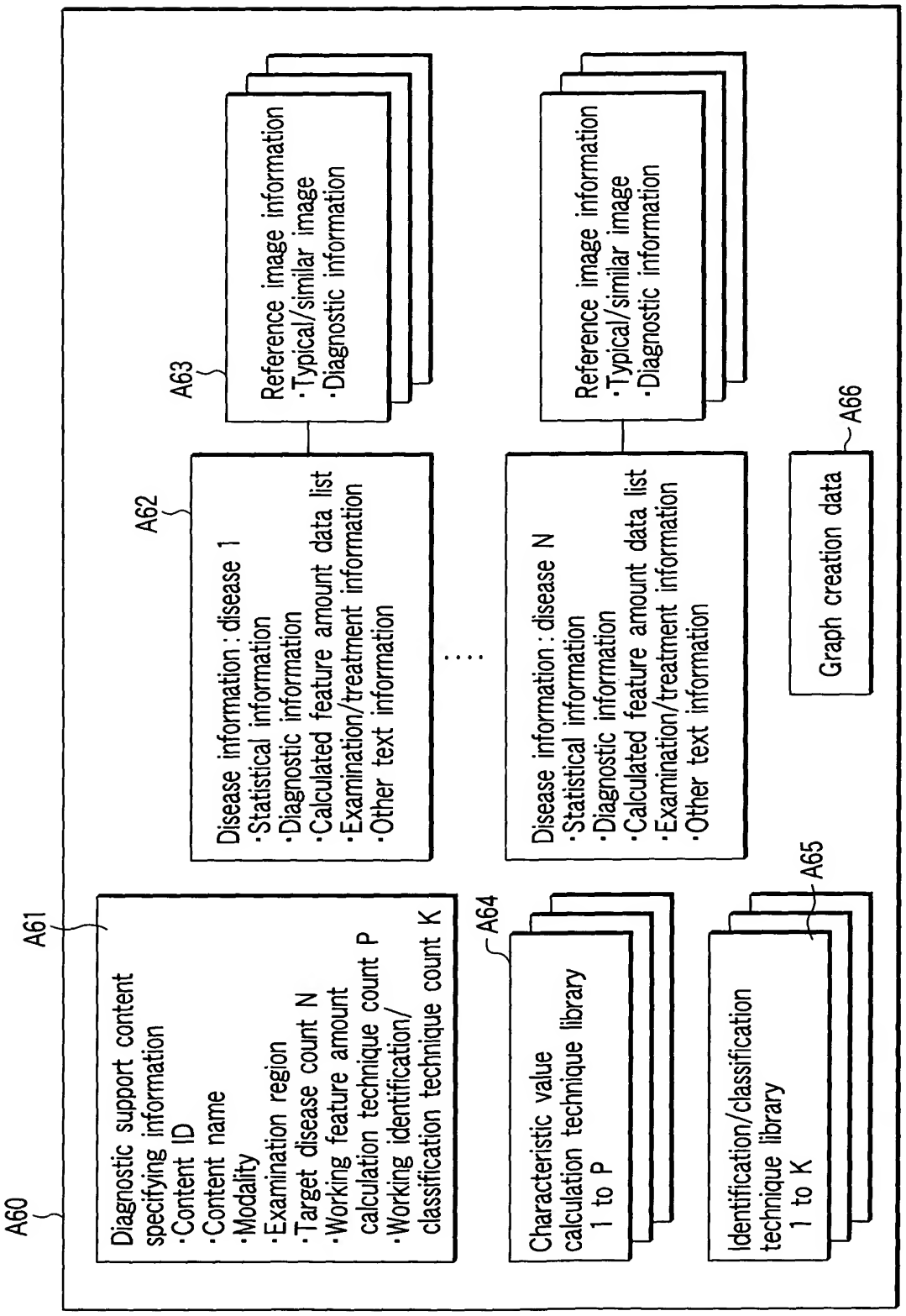

A60
A61
Diagnostic support content specifying information
·Content ID
·Content name
·Modality
·Examination region
·Target disease count N
·Working feature amount calculation technique count P
·Working identification/classification technique count K
A62
Disease information : disease 1
·Statistical information
·Diagnostic information
·Calculated feature amount data list
·Examination/treatment information
·Other text information
A63
Reference image information
·Typical/similar image
·Diagnostic information
Disease information : disease N
·Statistical information
·Diagnostic information
·Calculated feature amount data list
·Examination/treatment information
·Other text information
Reference image information
·Typical/similar image
·Diagnostic information
A64
Characteristic value calculation technique library 1 to P
A65
Identification/classification technique library 1 to K
A66
Graph creation data

FIG. 15

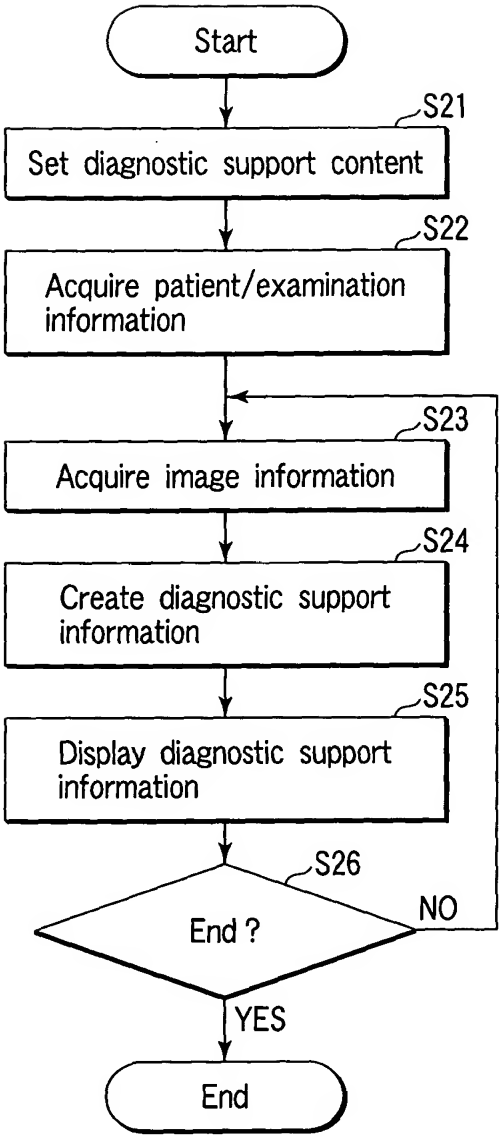

Start
S21
Set diagnostic support content
S22
Acquire patient/examination information
S23
Acquire image information
S24
Create diagnostic support information
S25
Display diagnostic support information
S26
End ?
NO
YES
End

FIG. 16

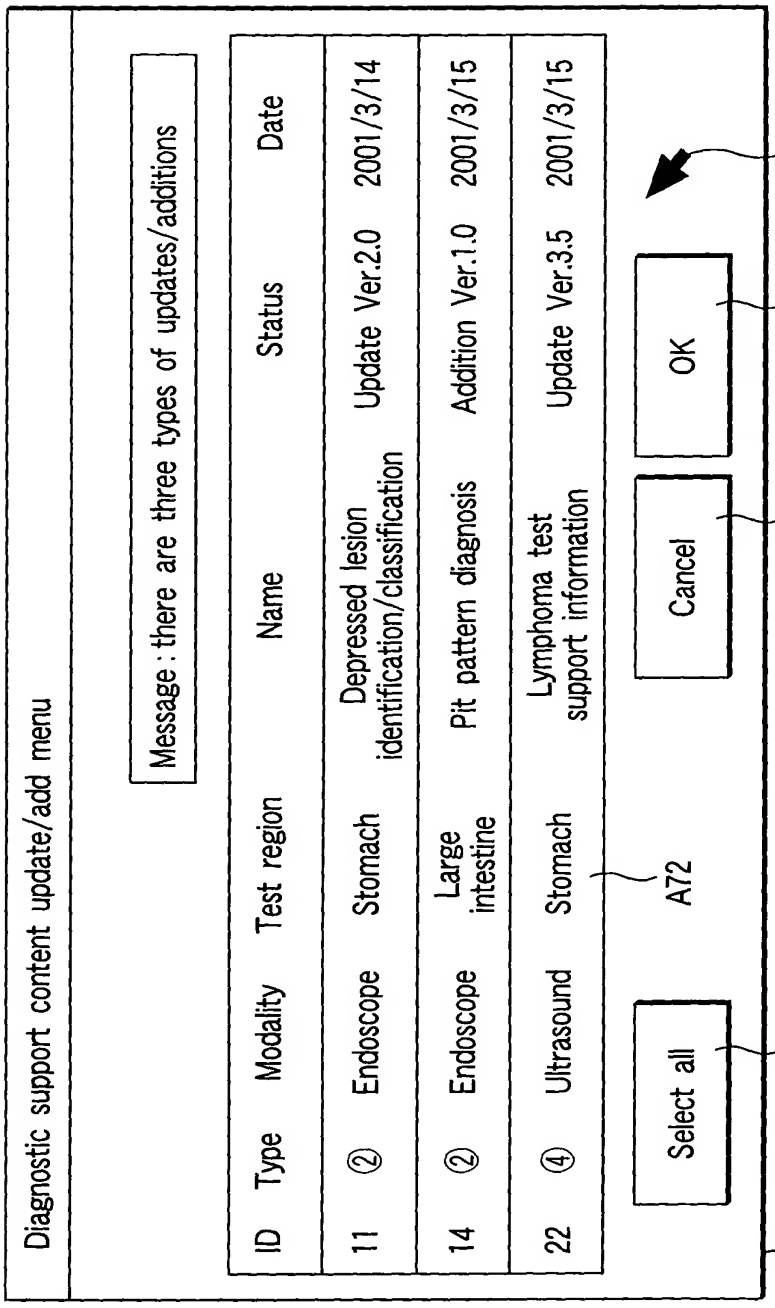

Diagnostic support content update/add menu
Message : there are three types of updates/additions
ID
Type
Modality
Test region
Name
Status
Date
11
②
Endoscope
Stomach
Depressed lesion identification/classification
Update Ver.2.0
2001/3/14
14
②
Endoscope
Large intestine
Pit pattern diagnosis
Addition Ver.1.0
2001/3/15
22
④
Ultrasound
Stomach
Lymphoma test support information
Update Ver.3.5
2001/3/15
Select all
Cancel
OK
A71
A72
A73
A74
A75
A76

FIG. 17

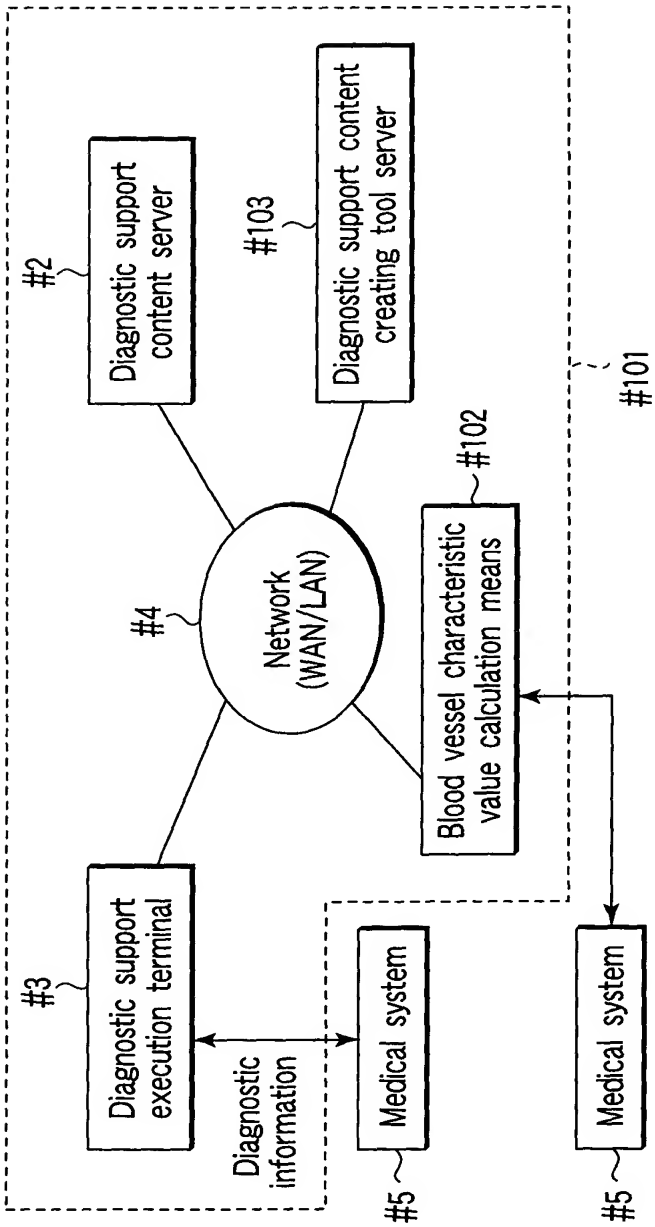

#2
Diagnostic support content server
#103
Diagnostic support content creating tool server
#101
#4
Network (WAN/LAN)
#102
Blood vessel characteristic value calculation means
#3
Diagnostic support execution terminal
Diagnostic information
Medical system
#5
Medical system
#5

FIG. 18

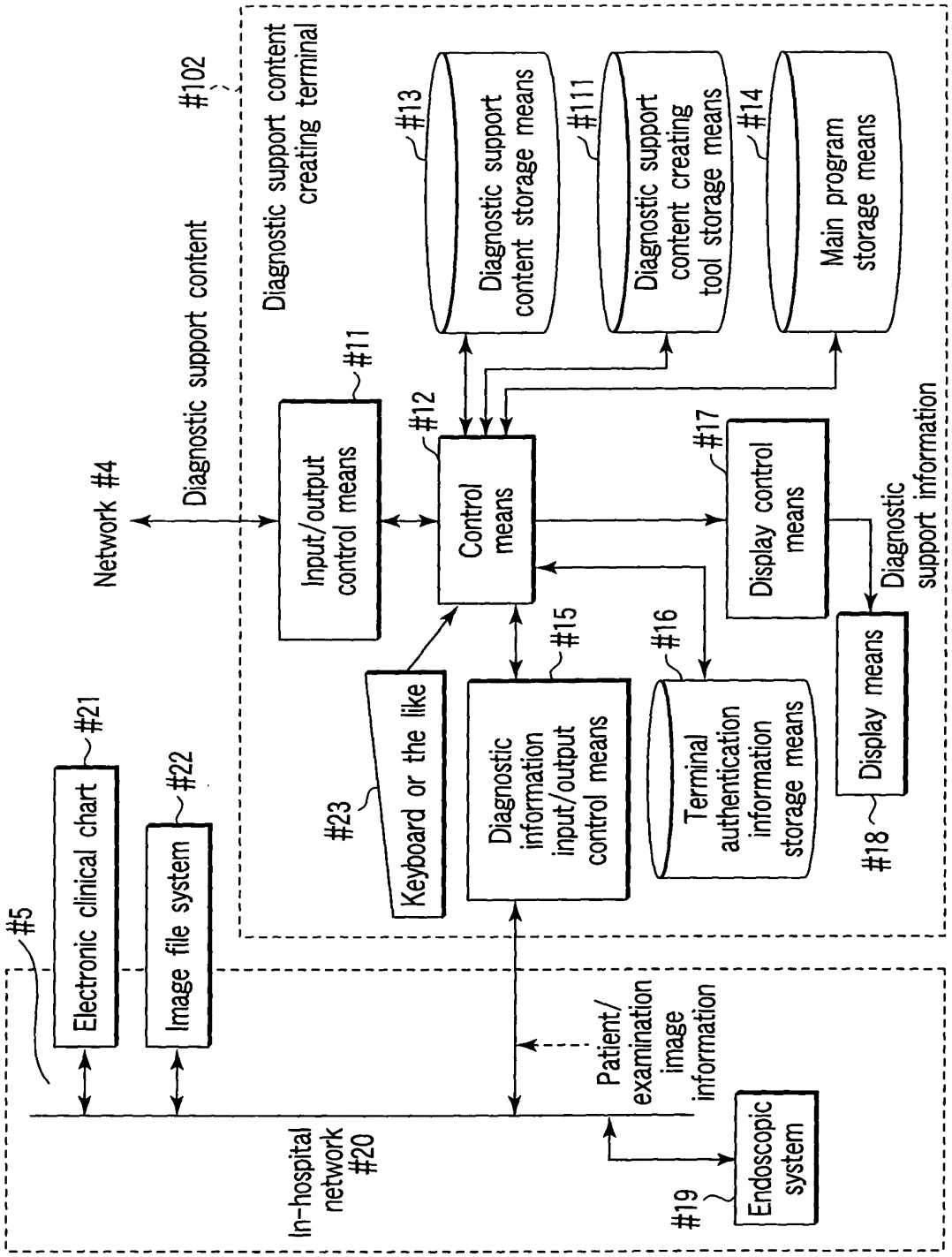

#5
Electronic clinical chart
#21
Image file system
#22
In-hospital network #20
Patient/ examination image information
Endoscopic system
#19
Network #4
Diagnostic support content
#102
Diagnostic support content creating terminal
Input/output control means
#11
Control means
#12
Diagnostic information input/output control means
#15
Keyboard or the like
#23
Terminal authentication information storage means
#16
Display control means
#17
Display means
#18
Diagnostic support information
Diagnostic support content storage means
#13
Diagnostic support content creating tool storage means
#111
Main program storage means
#14

FIG. 19

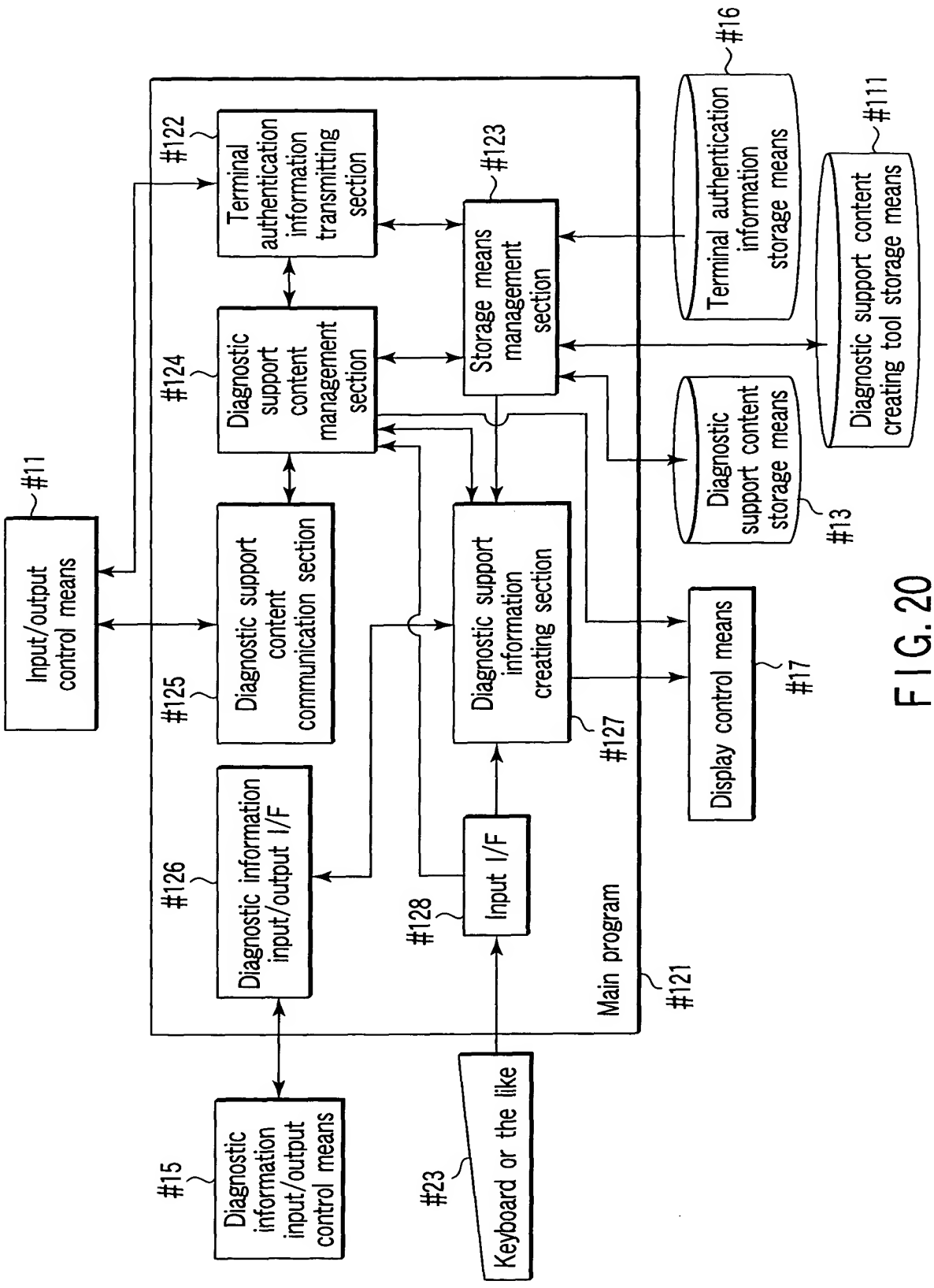

#11
Input/output control means
#122
Terminal authentication information transmitting section
#123
Storage means management section
#16
Terminal authentication information storage means
#111
Diagnostic support content creating tool storage means
#124
Diagnostic support content management section
#125
Diagnostic support content communication section
Diagnostic support information creating section
#127
Diagnostic support content storage means
#13
Display control means
#17
#126
Diagnostic information input/output I/F
#128
Input I/F
Main program
#121
#15
Diagnostic information input/output control means
#23
Keyboard or the like

FIG. 20

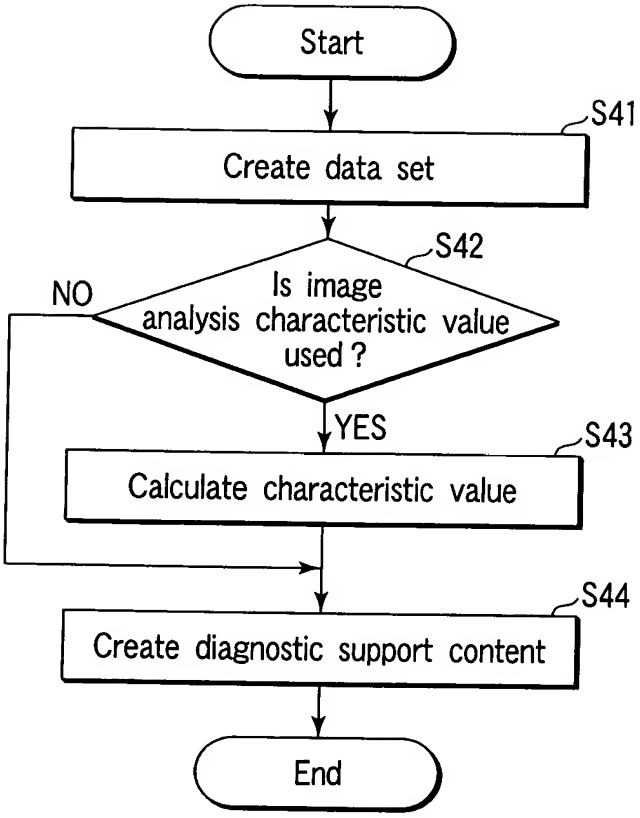

Start
S41
Create data set
S42
Is image analysis characteristic value used ?
NO
YES
S43
Calculate characteristic value
S44
Create diagnostic support content
End

FIG. 21

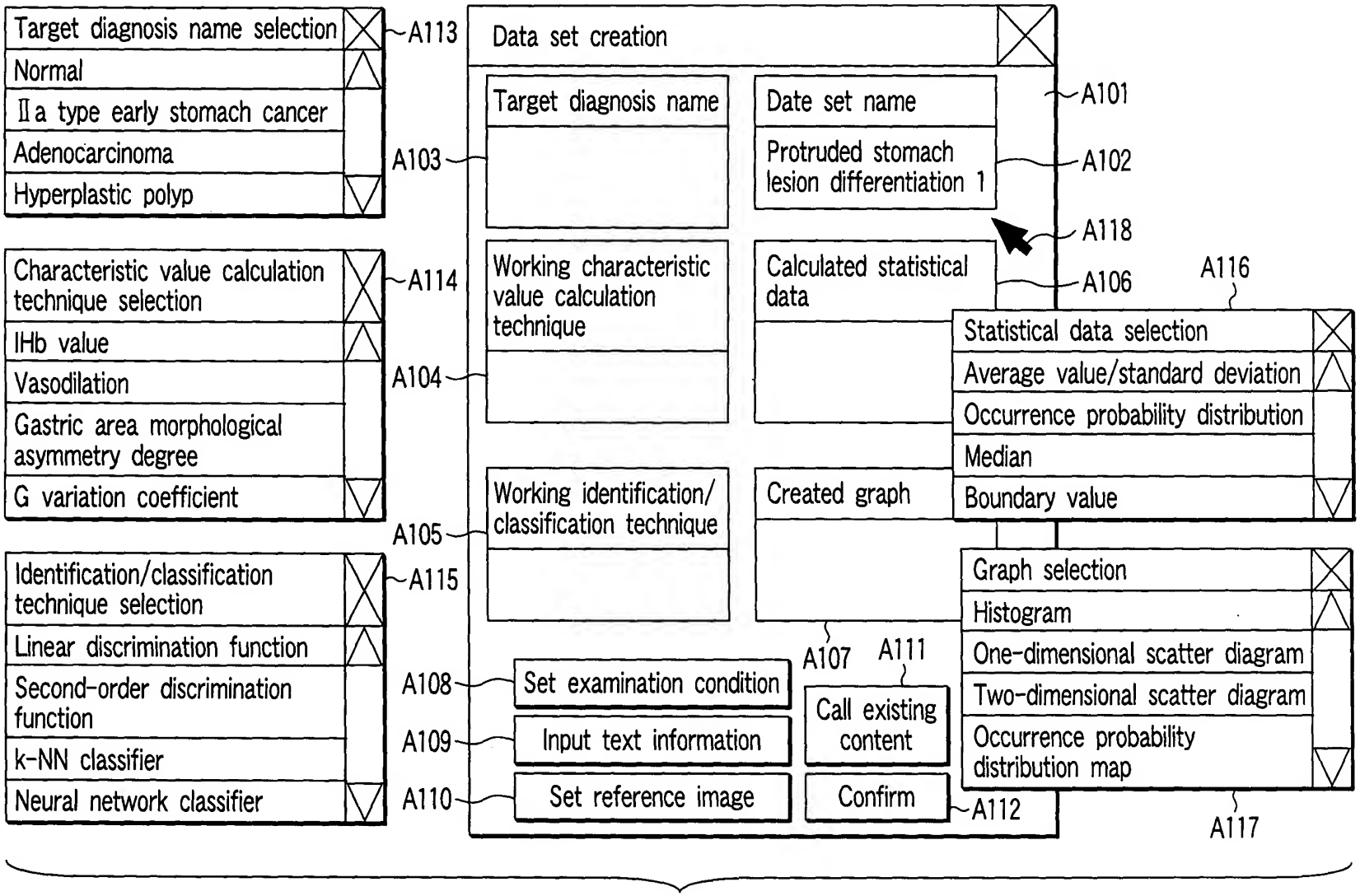

Target diagnosis name selection
Normal
IIa type early stomach cancer
Adenocarcinoma
Hyperplastic polyp
A113
Characteristic value calculation technique selection
IHb value
Vasodilation
Gastric area morphological asymmetry degree
G variation coefficient
A114
Identification/classification technique selection
Linear discrimination function
Second-order discrimination function
k-NN classifier
Neural network classifier
A115
Data set creation
Target diagnosis name
A103
Date set name
A101
Protruded stomach lesion differentiation 1
A102
A118
Working characteristic value calculation technique
A104
Calculated statistical data
A106
A116
Statistical data selection
Average value/standard deviation
Occurrence probability distribution
Median
Boundary value
Working identification/classification technique
A105
Created graph
Graph selection
Histogram
One-dimensional scatter diagram
Two-dimensional scatter diagram
Occurrence probability distribution map
A107
A111
A108
Set examination condition
A109
Input text information
A110
Set reference image
Call existing content
Confirm
A112
A117

FIG. 22

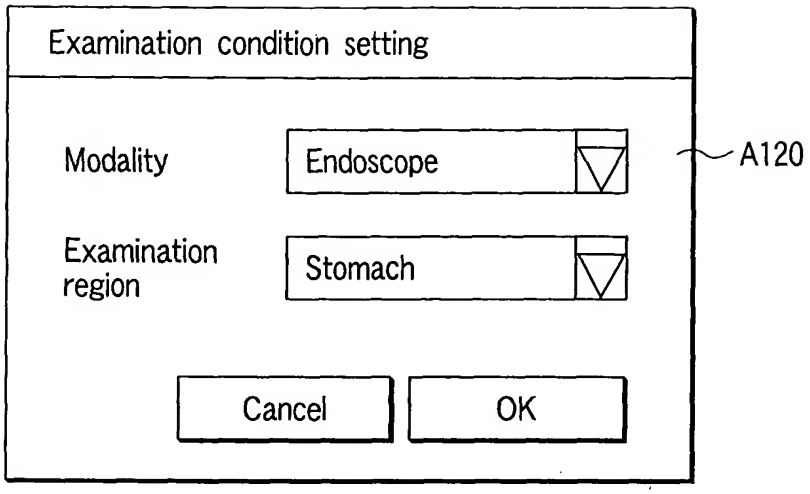

Examination condition setting
Modality
Endoscope
A120
Examination region
Stomach
Cancel
OK

FIG. 23

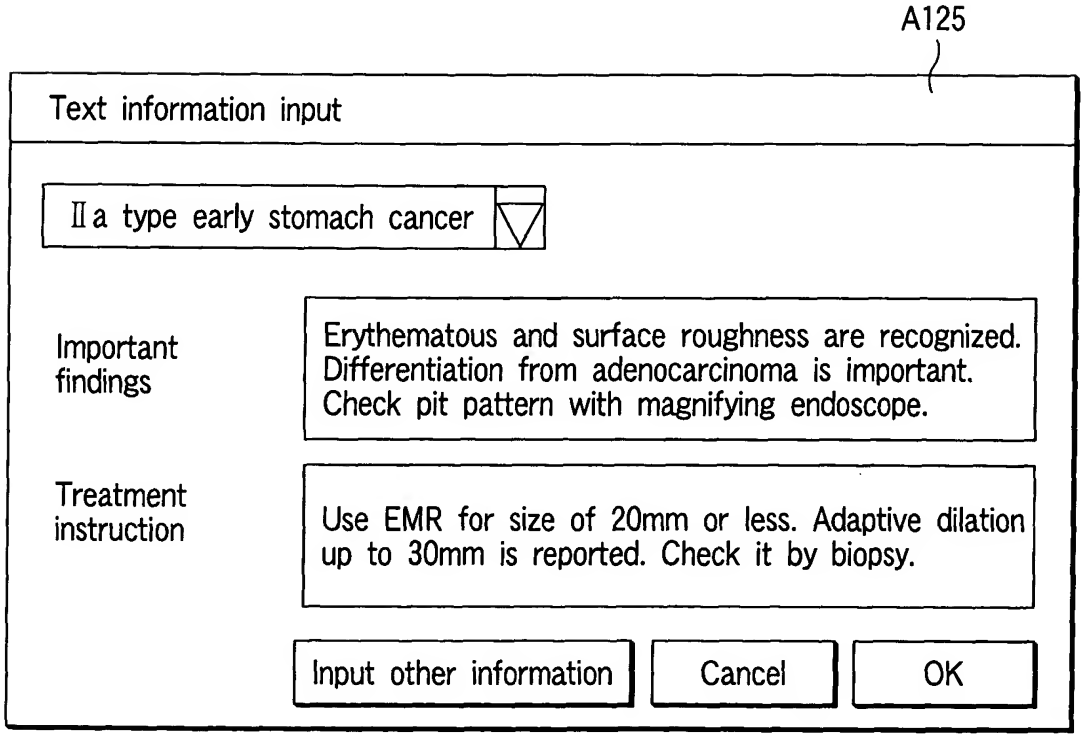

A125
Text information input
IIa type early stomach cancer
Important findings
Erythematous and surface roughness are recognized. Differentiation from adenocarcinoma is important. Check pit pattern with magnifying endoscope.
Treatment instruction
Use EMR for size of 20mm or less. Adaptive dilation up to 30mm is reported. Check it by biopsy.
Input other information
Cancel
OK

FIG. 24

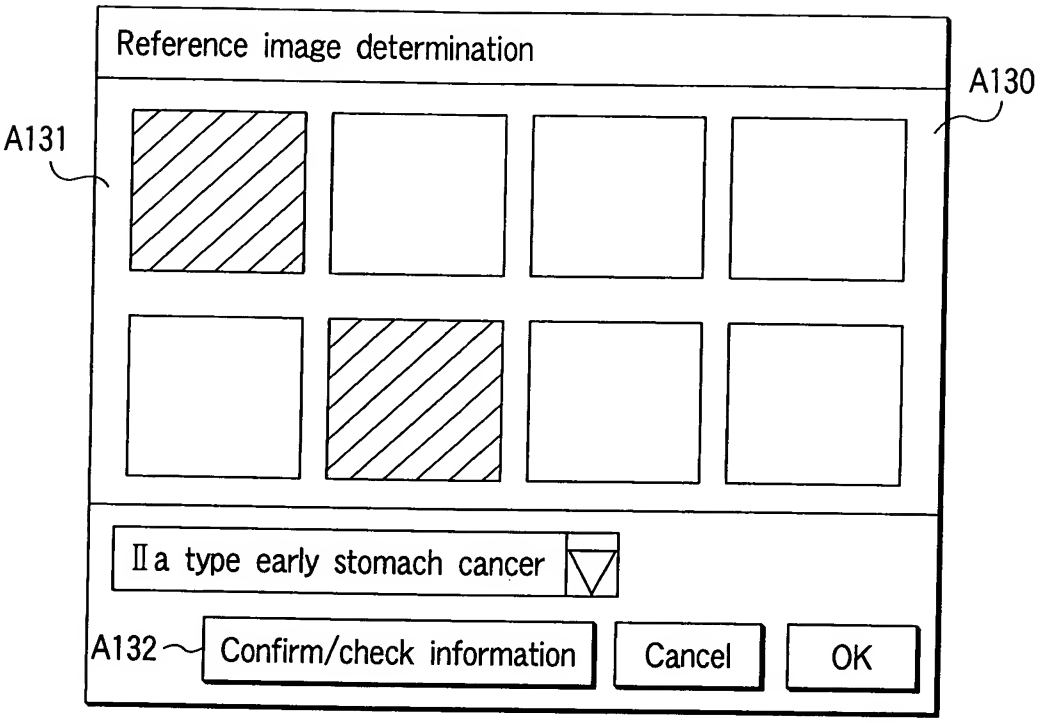

Reference image determination
A130
A131
IIa type early stomach cancer
A132
Confirm/check information
Cancel
OK

FIG. 25

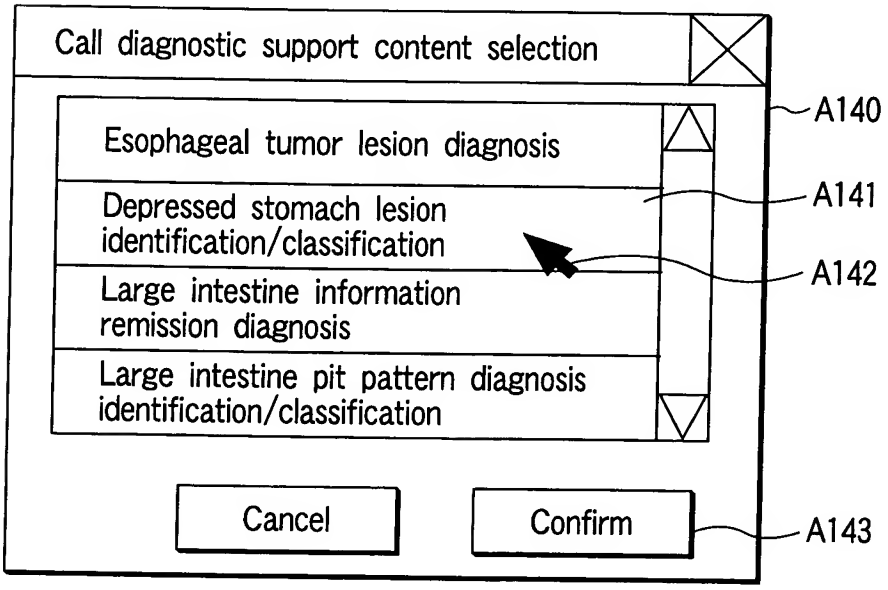

Call diagnostic support content selection
A140
Esophageal tumor lesion diagnosis
Depressed stomach lesion identification/classification
A141
A142
Large intestine information remission diagnosis
Large intestine pit pattern diagnosis identification/classification
Cancel
Confirm
A143

FIG. 26

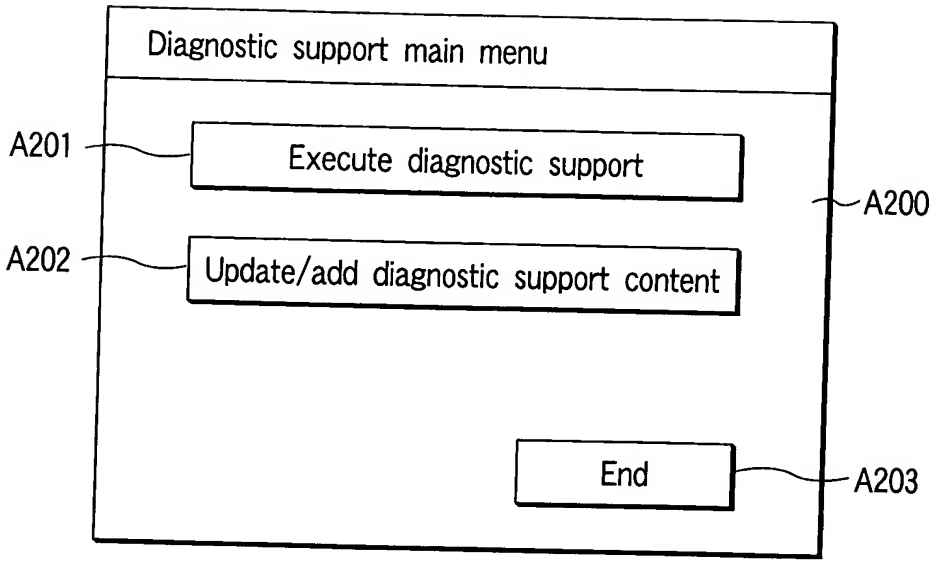

Diagnostic support main menu
A201
Execute diagnostic support
A200
A202
Update/add diagnostic support content
End
A203

FIG. 27

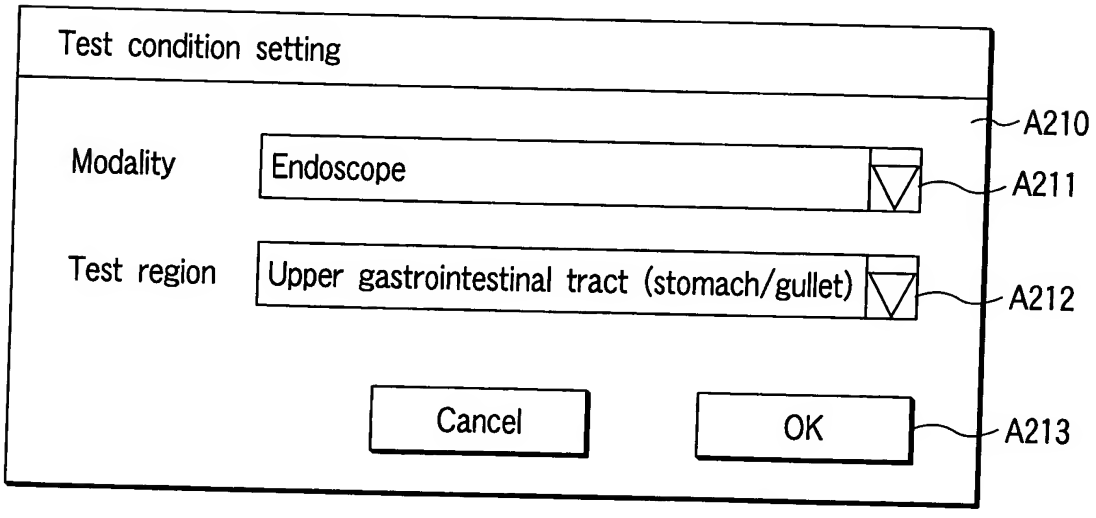

Test condition setting
A210
Modality
Endoscope
A211
Test region
Upper gastrointestinal tract (stomach/gullet)
A212
Cancel
OK
A213

FIG. 28

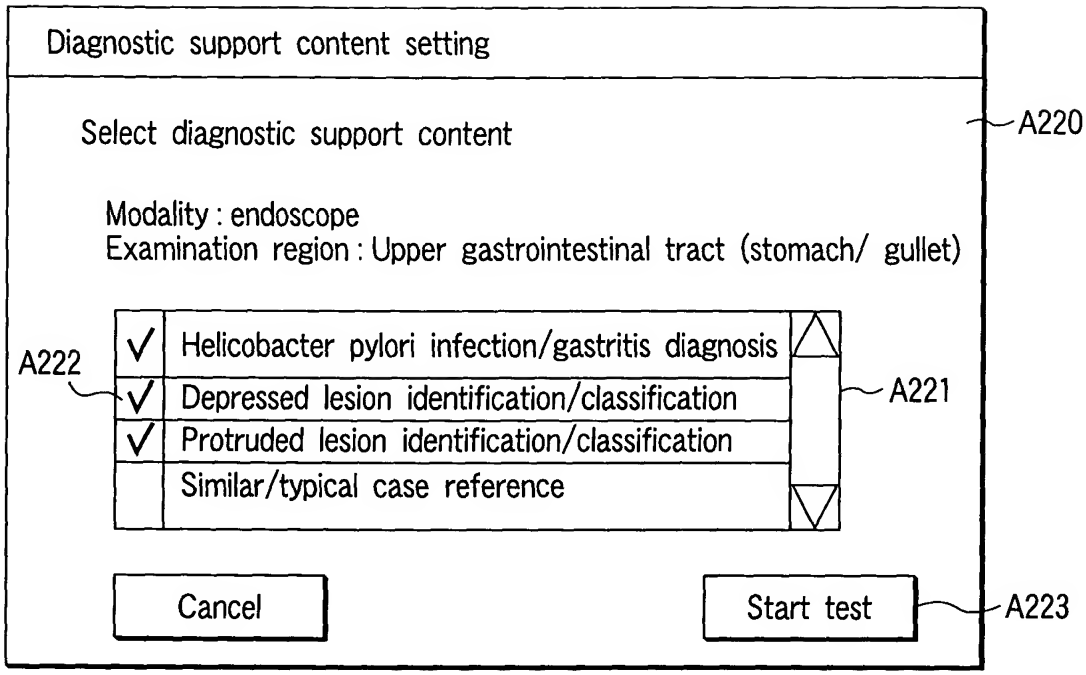

Diagnostic support content setting
Select diagnostic support content
A220
Modality : endoscope
Examination region : Upper gastrointestinal tract (stomach/ gullet)
A222
Helicobacter pylori infection/gastritis diagnosis
Depressed lesion identification/classification
Protruded lesion identification/classification
Similar/typical case reference
A221
Cancel
Start test
A223

FIG. 29

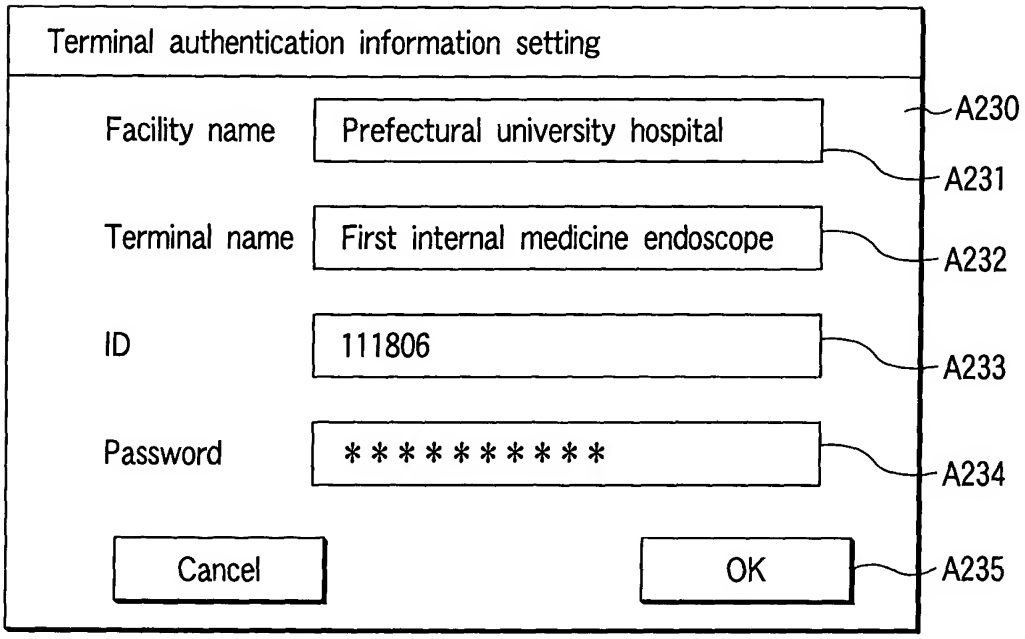

Terminal authentication information setting
Facility name
Prefectural university hospital
A230
A231
Terminal name
First internal medicine endoscope
A232
ID
111806
A233
Password
****
A234
Cancel
OK
A235

FIG. 30

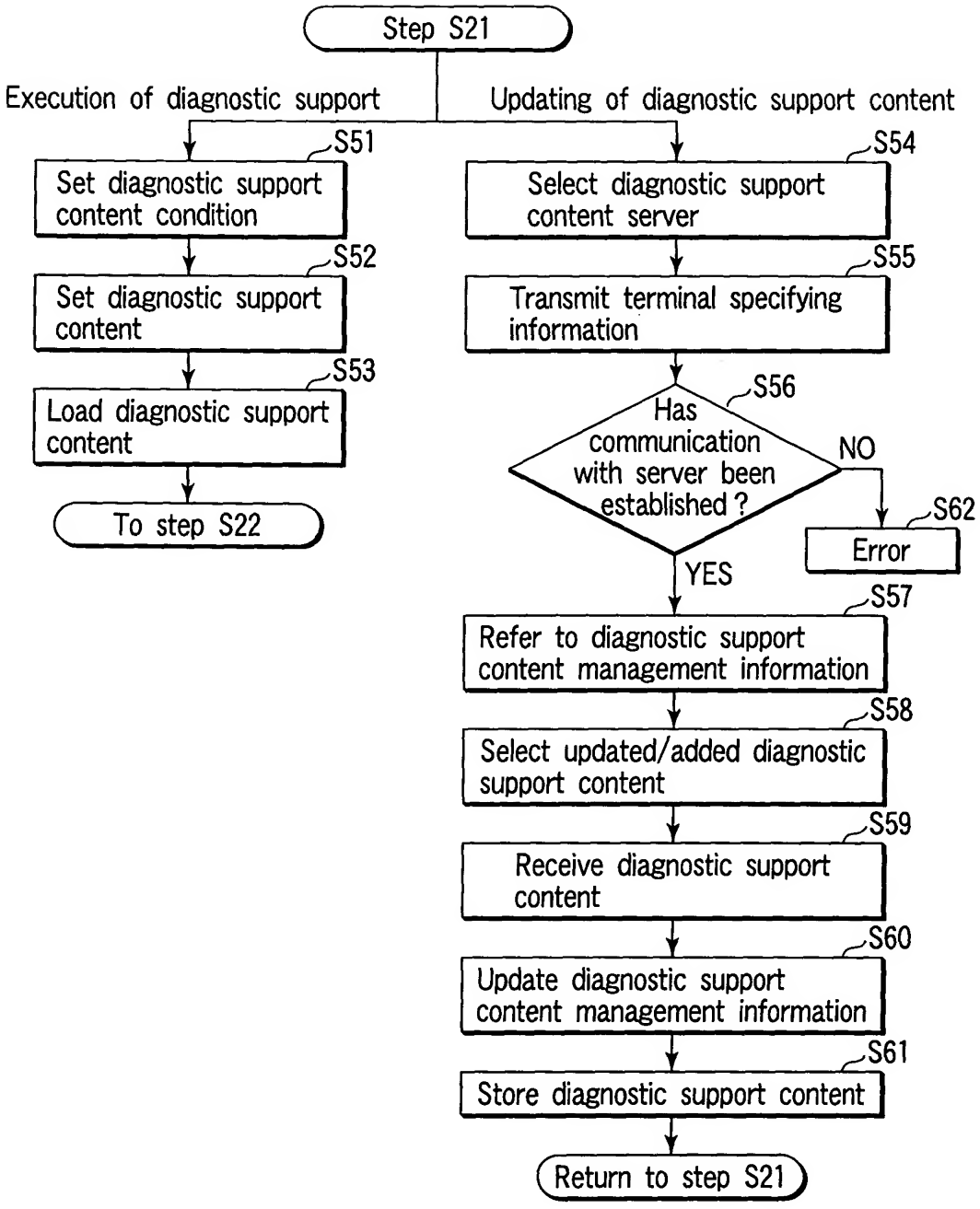

Step S21
Execution of diagnostic support
Updating of diagnostic support content
S51
Set diagnostic support content condition
S52
Set diagnostic support content
S53
Load diagnostic support content
To step S22
S54
Select diagnostic support content server
S55
Transmit terminal specifying information
S56
Has communication with server been established ?
NO
S62
Error
YES
S57
Refer to diagnostic support content management information
S58
Select updated/added diagnostic support content
S59
Receive diagnostic support content
S60
Update diagnostic support content management information
S61
Store diagnostic support content
Return to step S21

FIG. 31

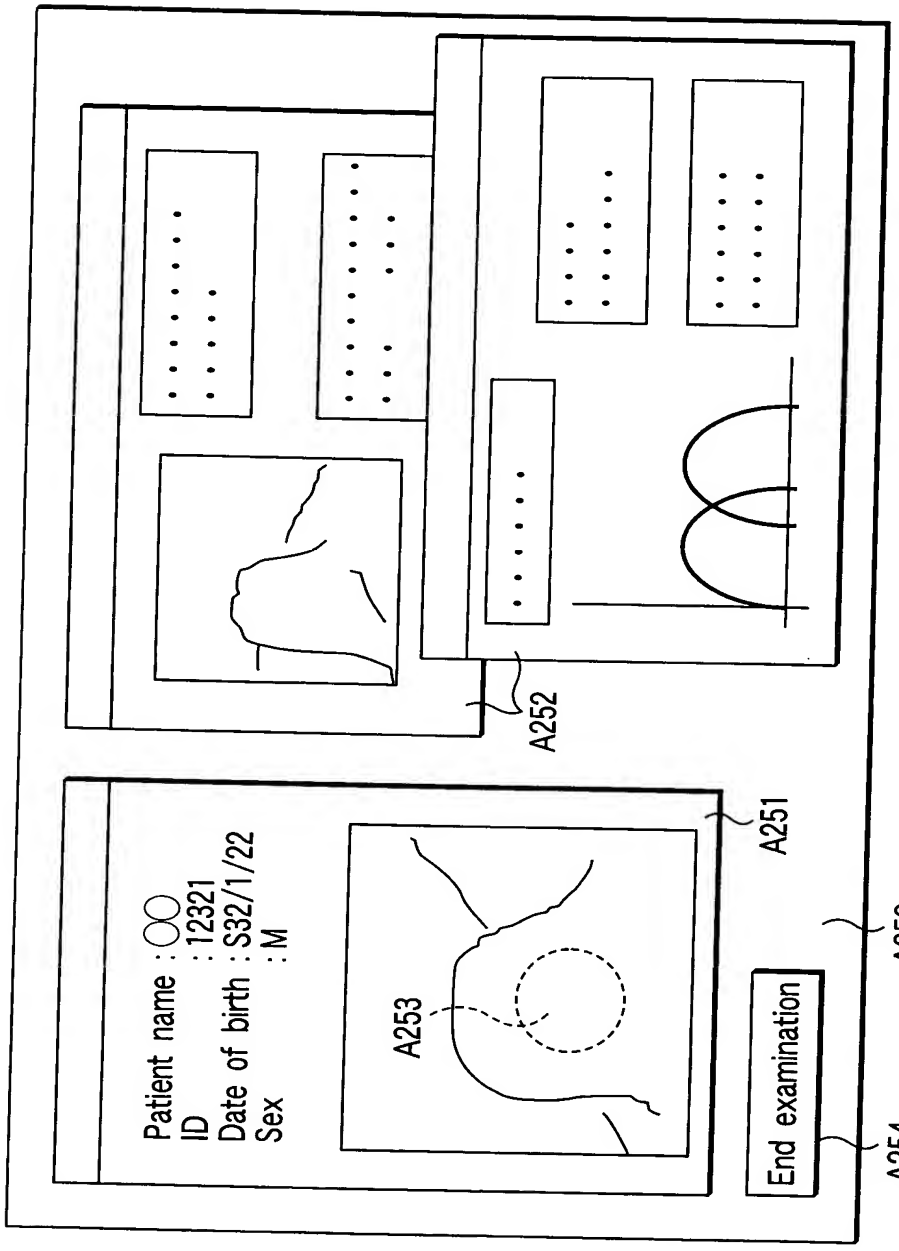

Patient name : ○○
ID : 12321
Date of birth : S32/1/22
Sex : M
A253
A251
A252
A250
End examination
A254

FIG. 32

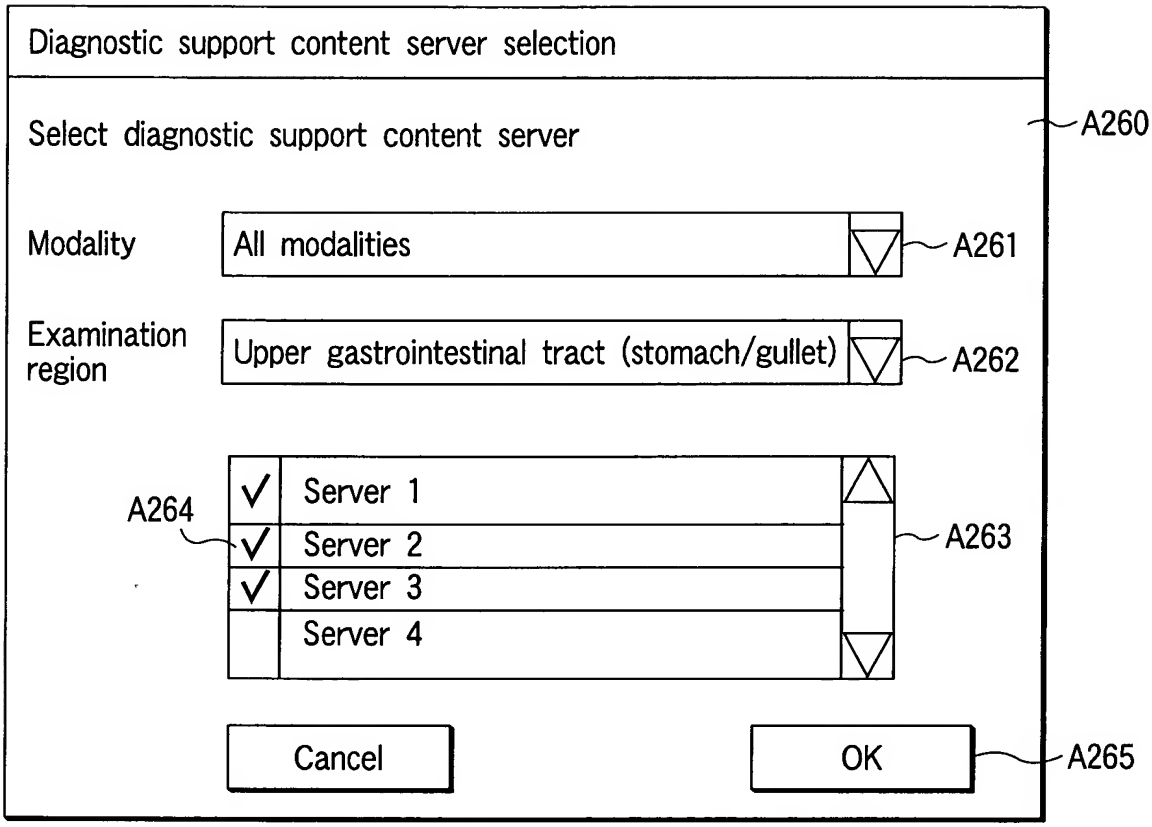

Diagnostic support content server selection
Select diagnostic support content server
A260
Modality
All modalities
A261
Examination region
Upper gastrointestinal tract (stomach/gullet)
A262
A264
Server 1
Server 2
Server 3
Server 4
A263
Cancel
OK
A265

FIG. 33

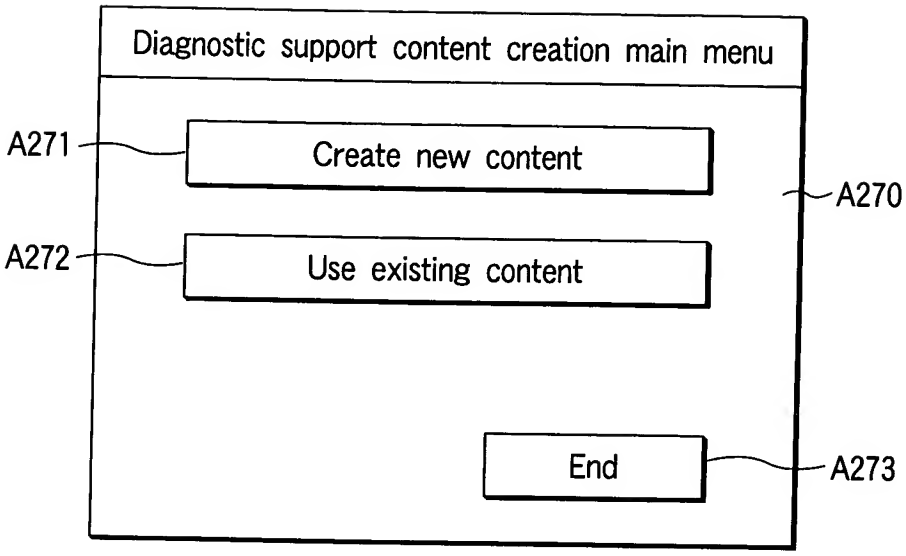

Diagnostic support content creation main menu
A271
Create new content
A270
A272
Use existing content
End
A273

FIG. 34

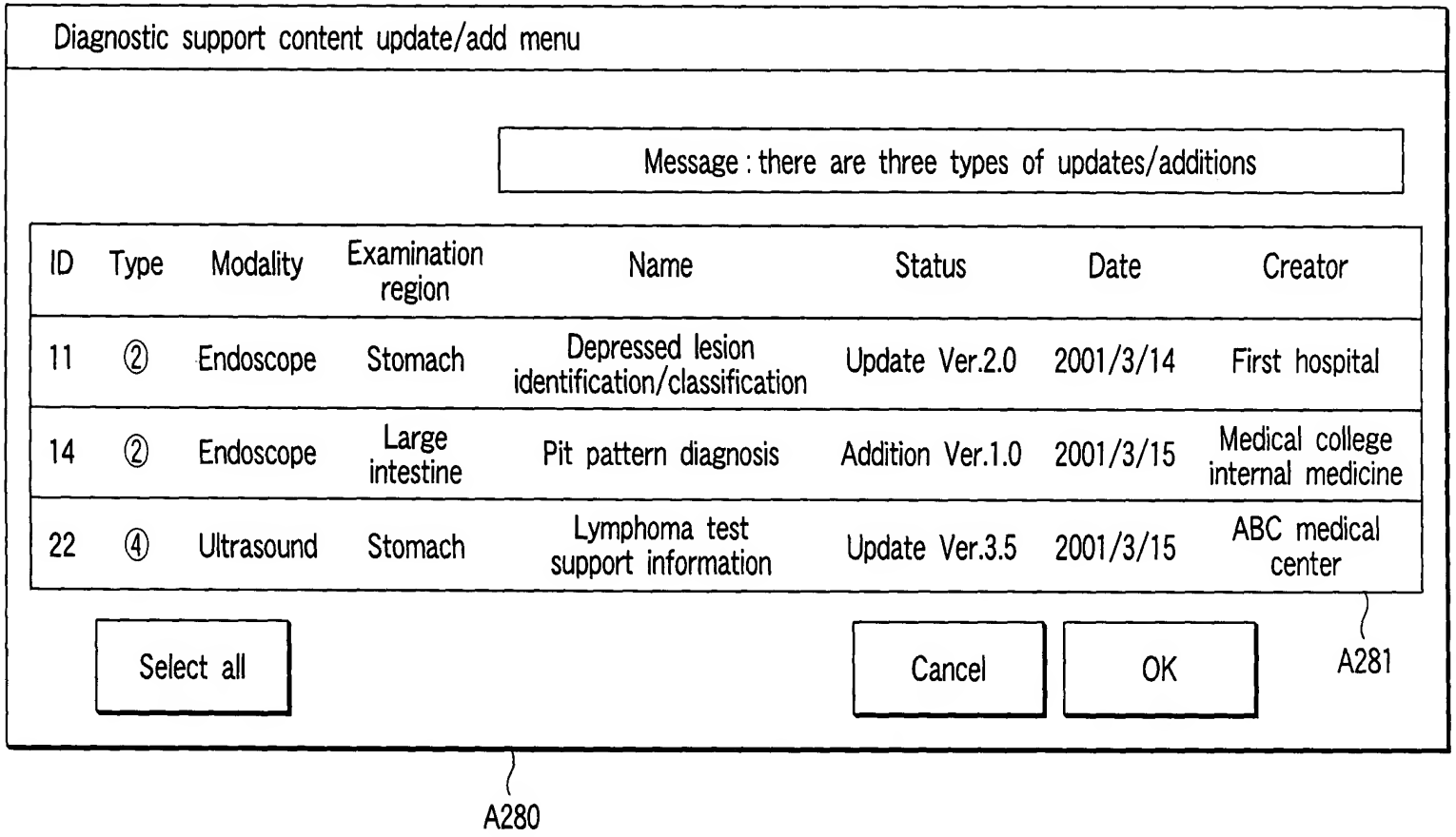

Diagnostic support content update/add menu
Message : there are three types of updates/additions
ID
Type
Modality
Examination region
Name
Status
Date
Creator
11
②
Endoscope
Stomach
Depressed lesion identification/classification
Update Ver.2.0
2001/3/14
First hospital
14
②
Endoscope
Large intestine
Pit pattern diagnosis
Addition Ver.1.0
2001/3/15
Medical college internal medicine
22
④
Ultrasound
Stomach
Lymphoma test support information
Update Ver.3.5
2001/3/15
ABC medical center
Select all
Cancel
OK
A281
A280

FIG. 35

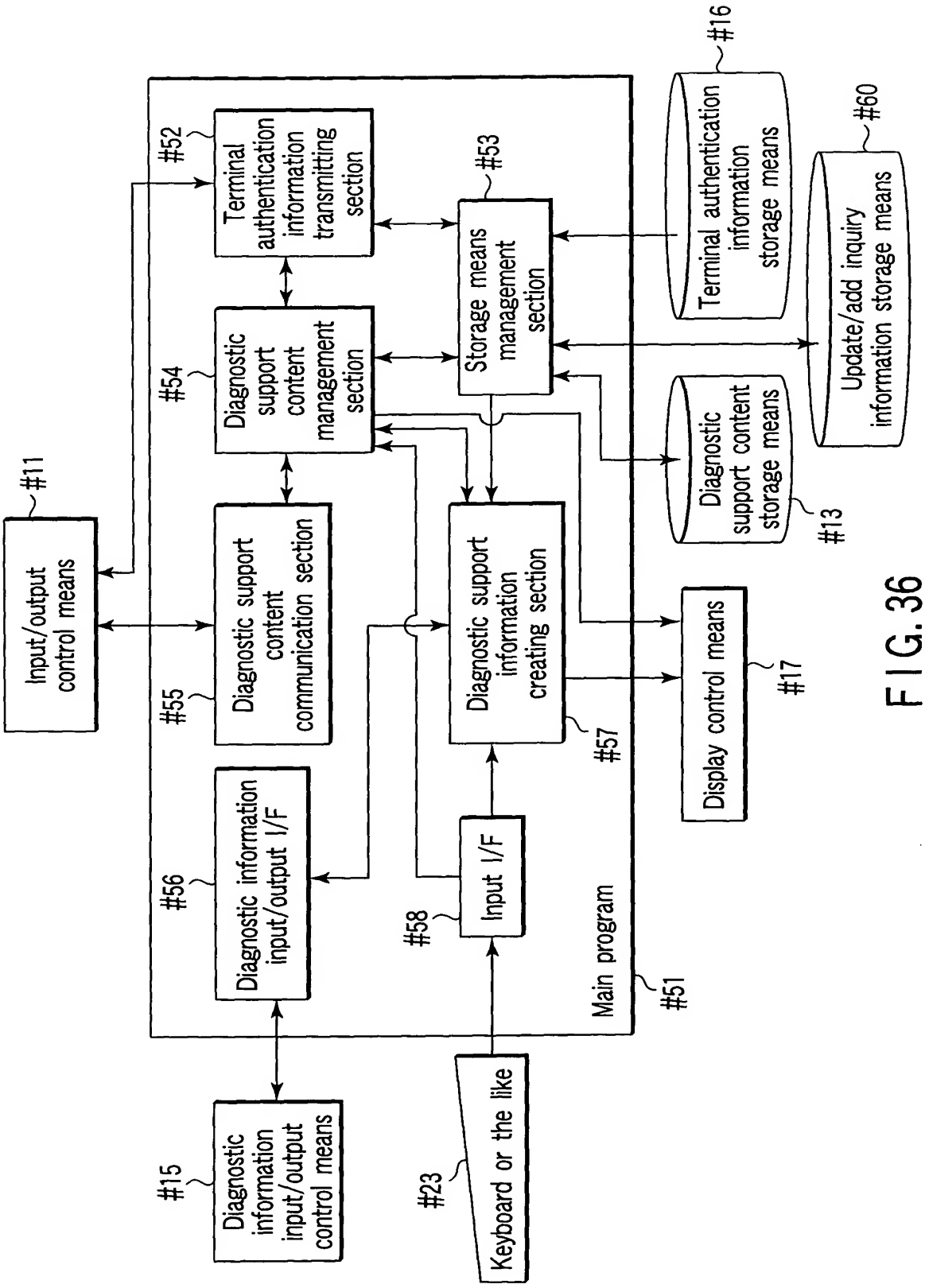

Input/output control means
#11
Terminal authentication information transmitting section
#52
Diagnostic support content management section
#54
Diagnostic support content communication section
#55
Diagnostic information input/output I/F
#56
Input I/F
#58
Diagnostic support information creating section
#57
Storage means management section
#53
Main program
#51
Display control means
#17
Terminal authentication information storage means
#16
Diagnostic support content storage means
#13
Update/add inquiry information storage means
#60
Diagnostic information input/output control means
#15
Keyboard or the like
#23

FIG. 36

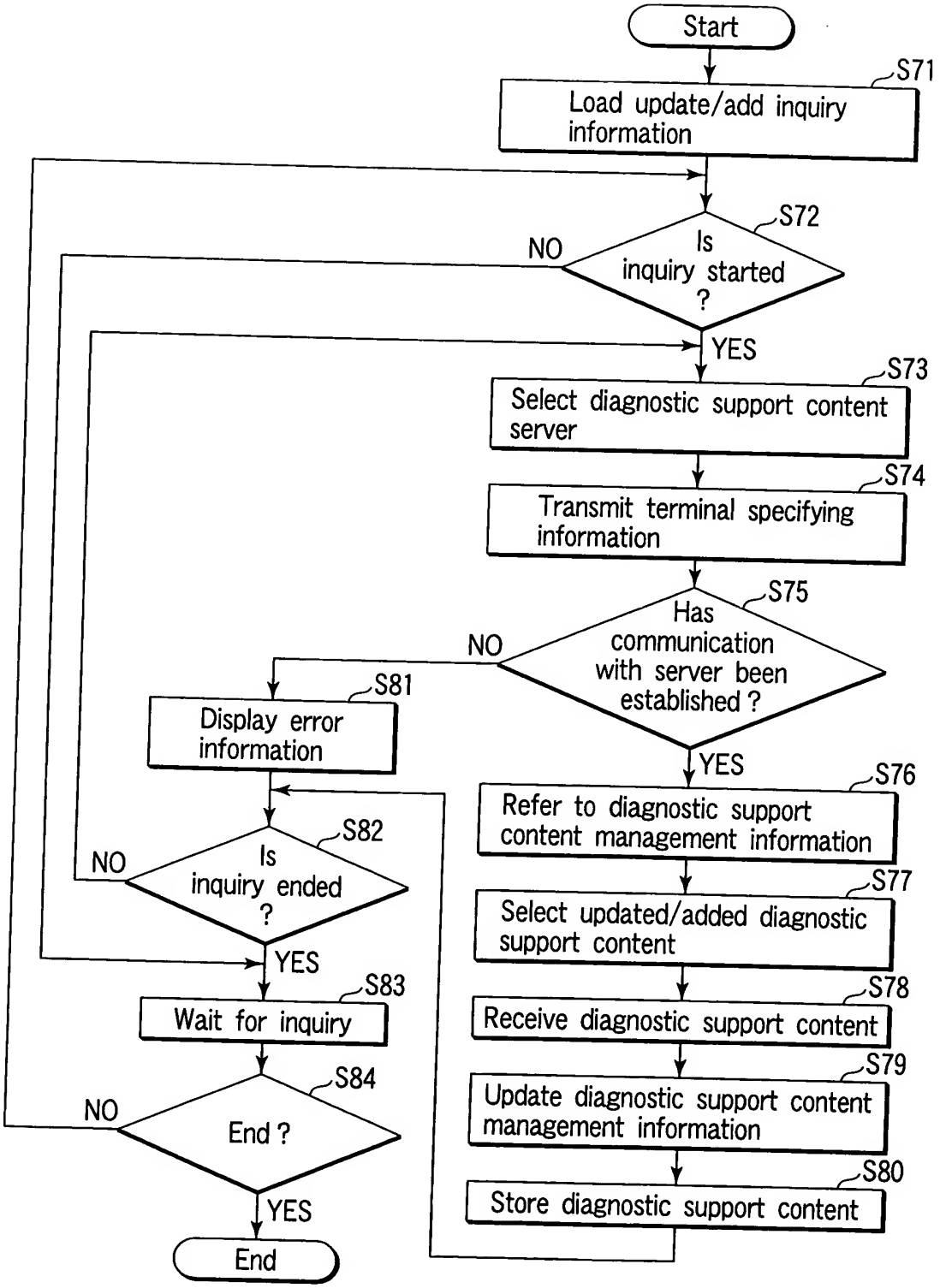

Start
S71
Load update/add inquiry information
S72
Is inquiry started ?
NO
YES
S73
Select diagnostic support content server
S74
Transmit terminal specifying information
S75
Has communication with server been established ?
NO
YES
S81
Display error information
S76
Refer to diagnostic support content management information
S82
Is inquiry ended ?
NO
YES
S77
Select updated/added diagnostic support content
S83
Wait for inquiry
S78
Receive diagnostic support content
S84
End ?
NO
YES
S79
Update diagnostic support content management information
S80
Store diagnostic support content
End

FIG. 37

Inquiry timing : startup, end of examination, two-hour intervals, 15:00	A291
Diagnostic support content server ID	Diagnostic support content ID
001A	12345
001A	23456
002B	ALL
003C	22422
003C	33333

A290

A292

FIG. 38

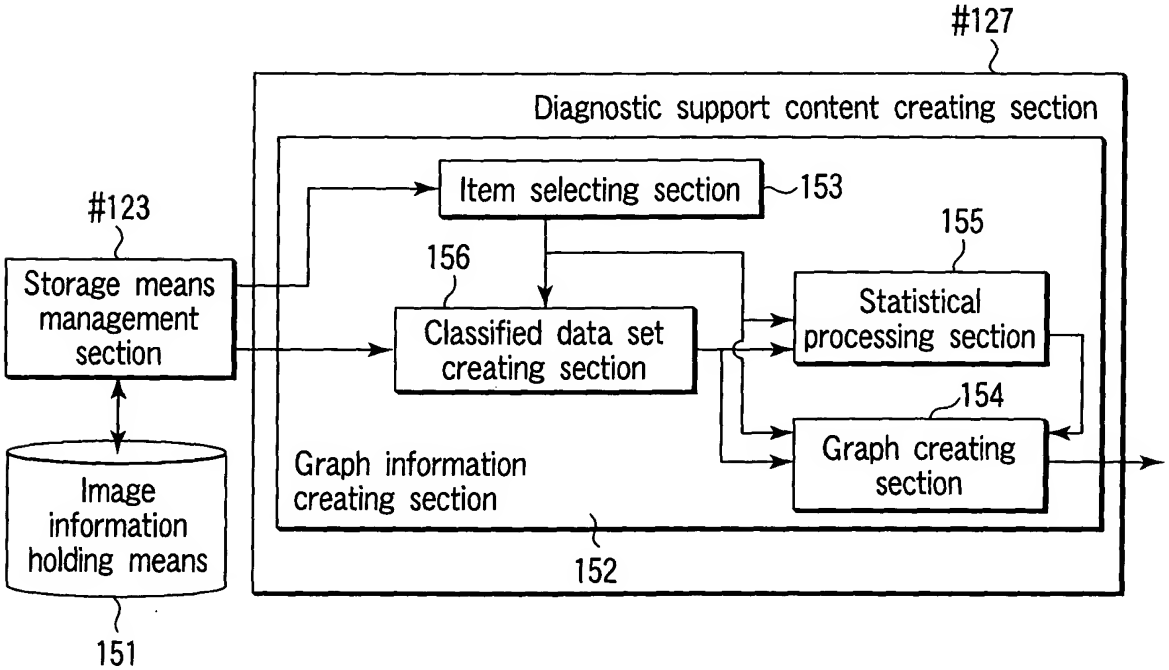


FIG. 39

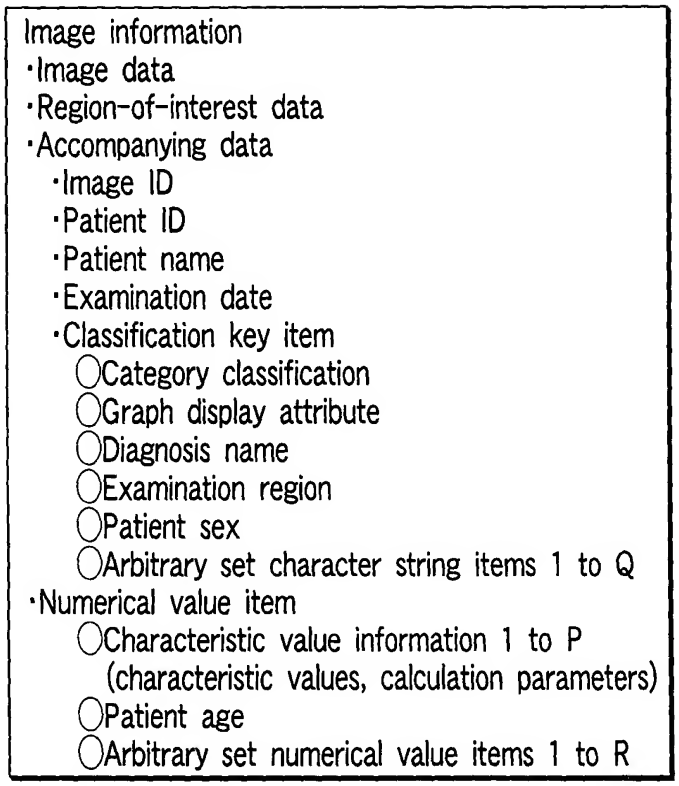


FIG. 40A

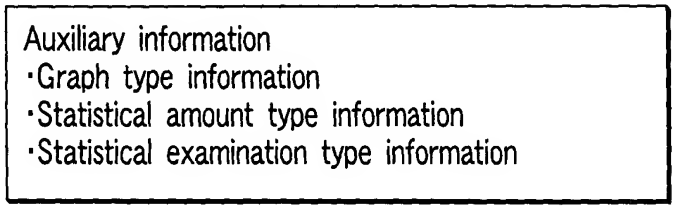


FIG. 40C

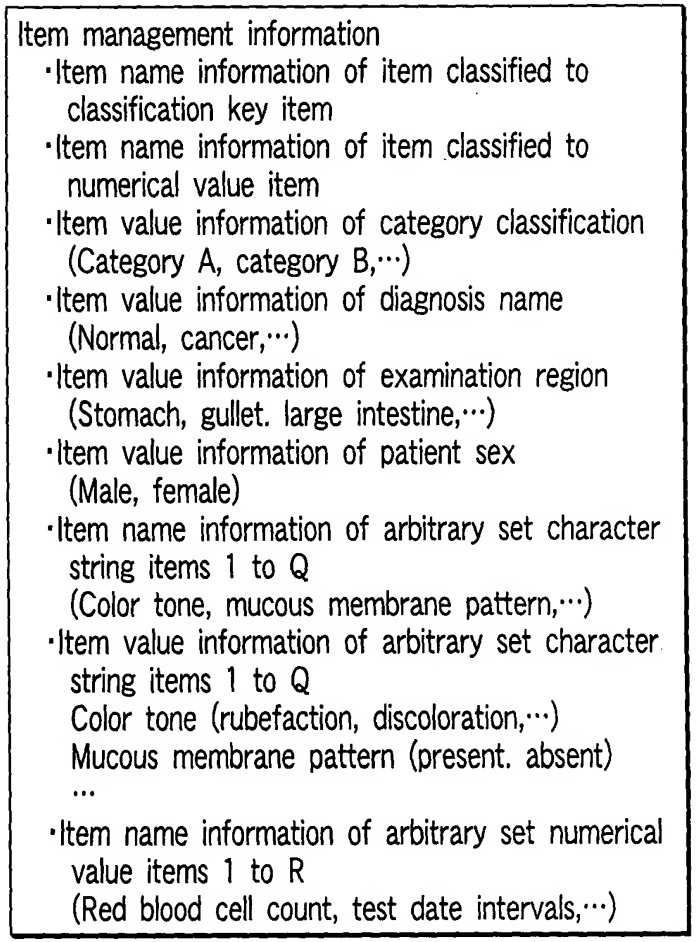


FIG. 40B

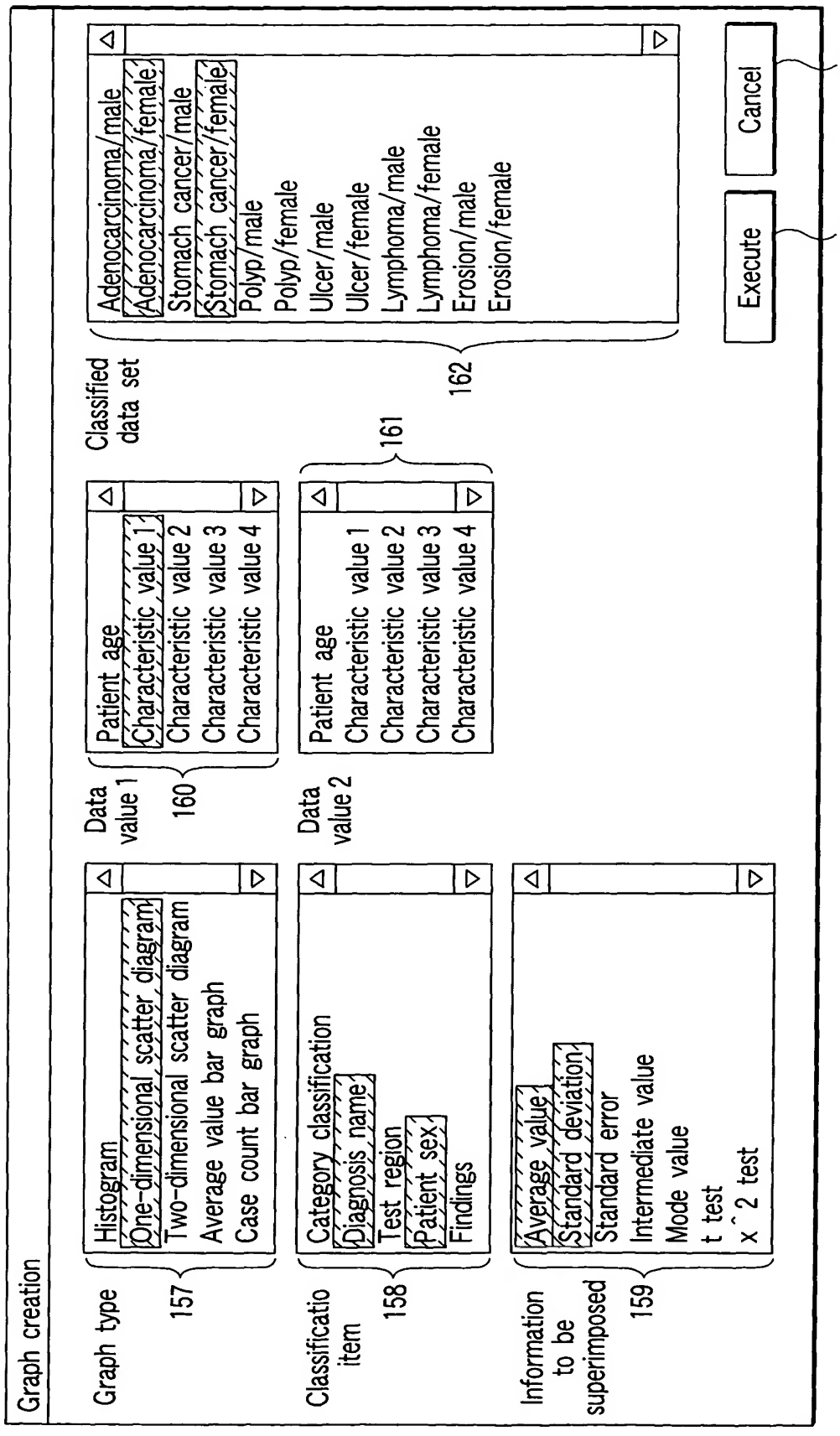

Graph creation
Graph type
Histogram
One-dimensional scatter diagram
Two-dimensional scatter diagram
Average value bar graph
Case count bar graph
157
Data value 1
Patient age
Characteristic value 11
Characteristic value 2
Characteristic value 3
Characteristic value 4
160
Classificatio item
Category classification
Diagnosis name
Test region
Patient sex
Findings
158
Data value 2
Patient age
Characteristic value 1
Characteristic value 2
Characteristic value 3
Characteristic value 4
161
Information to be superimposed
Average value
Standard deviation
Standard error
Intermediate value
Mode value
t test
x ^ 2 test
159
Classified data set
Adenocarcinoma/male
Adenocarcinoma/female
Stomach cancer/male
Stomach cancer/female
Polyp/male
Polyp/female
Ulcer/male
Ulcer/female
Lymphoma/male
Lymphoma/female
Erosion/male
Erosion/female
162
Execute
163
Cancel
164

FIG. 41

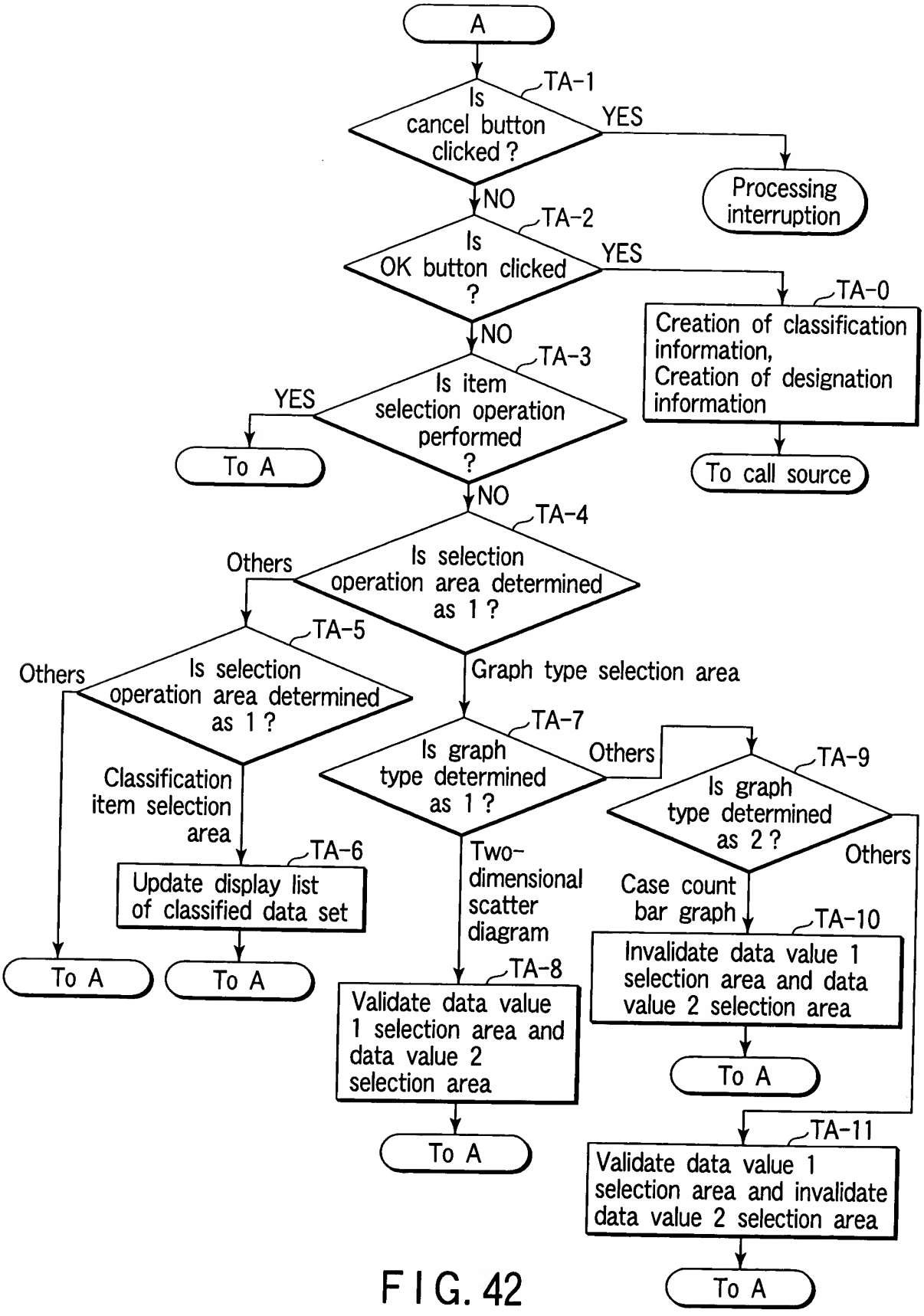

A
TA-1
Is cancel button clicked ?
YES
Processing interruption
NO
TA-2
Is OK button clicked ?
YES
TA-0
Creation of classification information, Creation of designation information
To call source
NO
TA-3
Is item selection operation performed ?
YES
To A
NO
TA-4
Is selection operation area determined as 1 ?
Others
TA-5
Is selection operation area determined as 1 ?
Others
To A
Graph type selection area
TA-7
Is graph type determined as 1 ?
Others
TA-9
Is graph type determined as 2 ?
Others
Classification item selection area
TA-6
Update display list of classified data set
To A
Two-dimensional scatter diagram
TA-8
Validate data value 1 selection area and data value 2 selection area
To A
Case count bar graph
TA-10
Invalidate data value 1 selection area and data value 2 selection area
To A
TA-11
Validate data value 1 selection area and invalidate data value 2 selection area
To A

FIG. 42

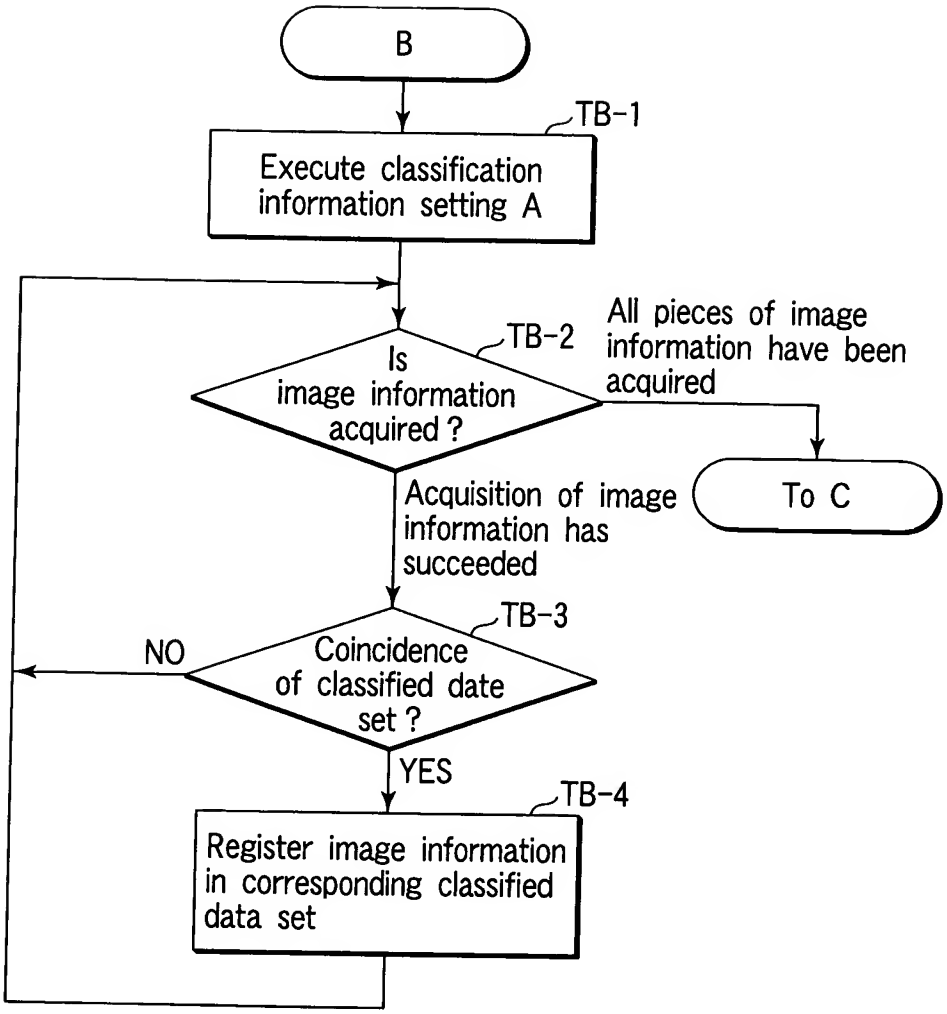

B
TB-1
Execute classification information setting A
TB-2
Is image information acquired ?
All pieces of image information have been acquired
To C
Acquisition of image information has succeeded
TB-3
Coincidence of classified date set ?
NO
YES
TB-4
Register image information in corresponding classified data set

FIG. 43

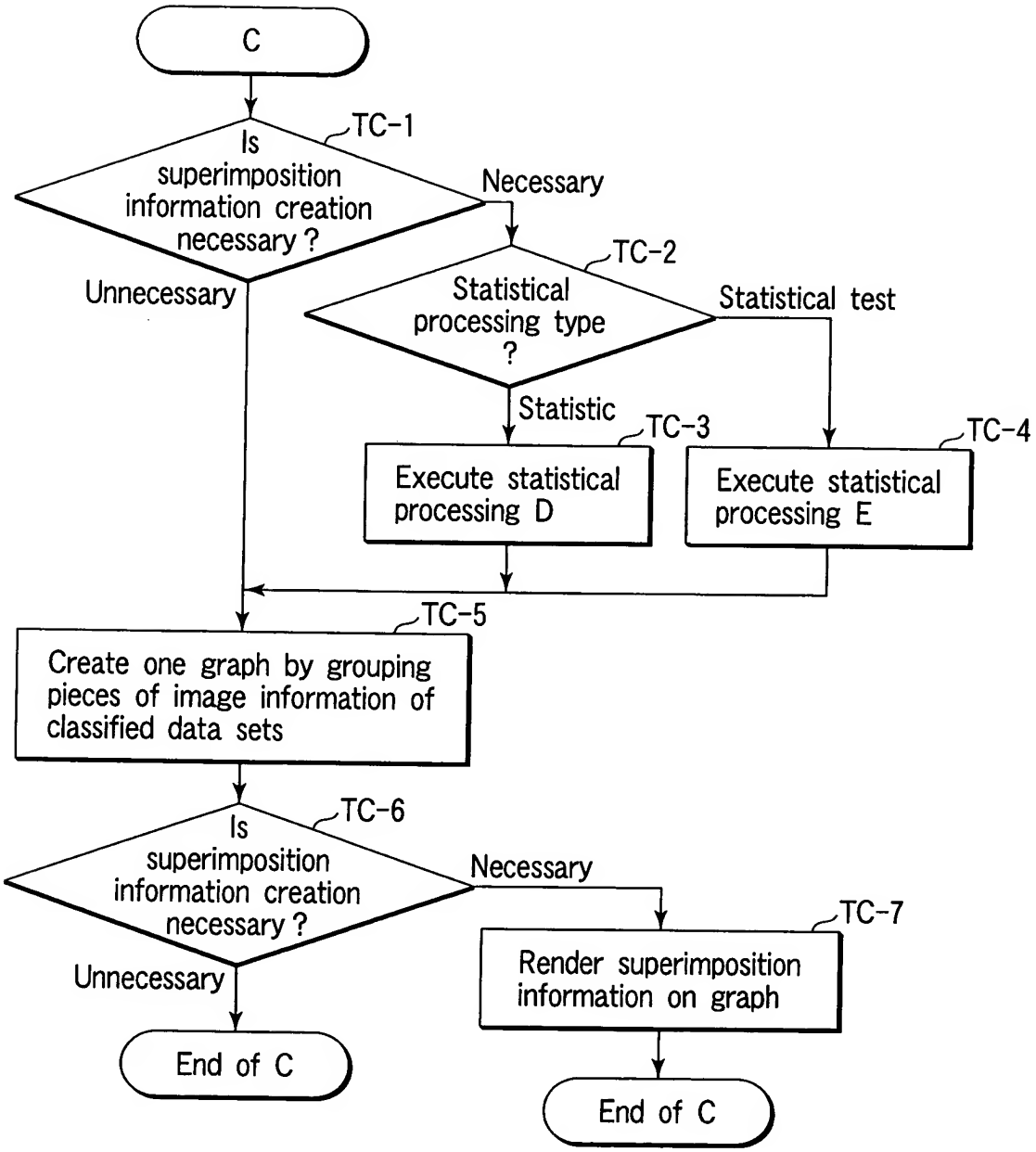

C
TC-1
Is superimposition information creation necessary ?
Necessary
Unnecessary
TC-2
Statistical processing type ?
Statistical test
Statistic
TC-3
Execute statistical processing D
TC-4
Execute statistical processing E
TC-5
Create one graph by grouping pieces of image information of classified data sets
TC-6
Is superimposition information creation necessary ?
Necessary
Unnecessary
TC-7
Render superimposition information on graph
End of C
End of C

FIG. 44

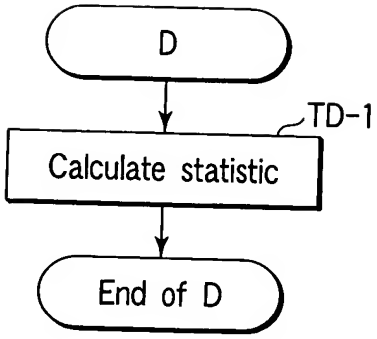

D
TD-1
Calculate statistic
End of D

FIG. 45

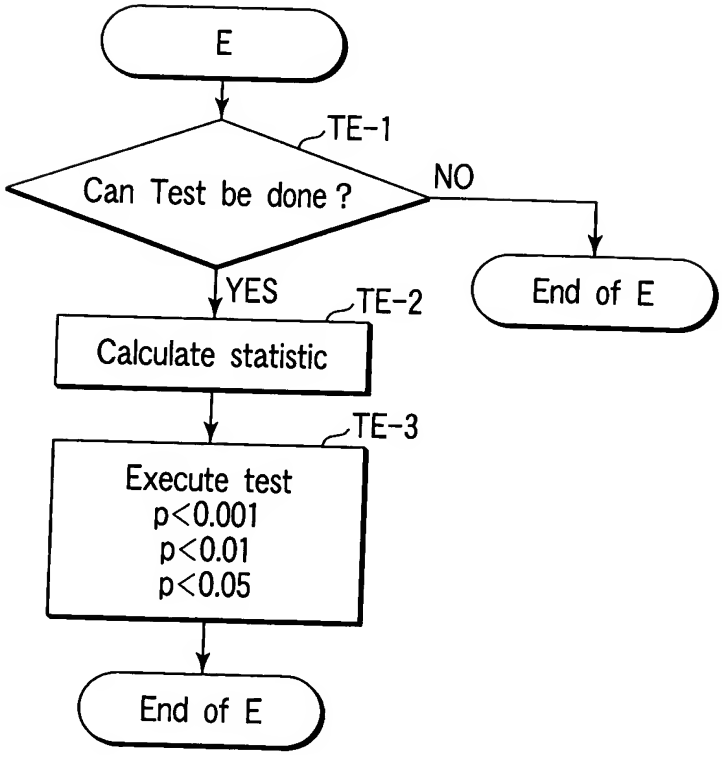

E
TE-1
Can Test be done ?
NO
End of E
YES
TE-2
Calculate statistic
TE-3
Execute test
p<0.001
p<0.01
p<0.05
End of E

FIG. 46

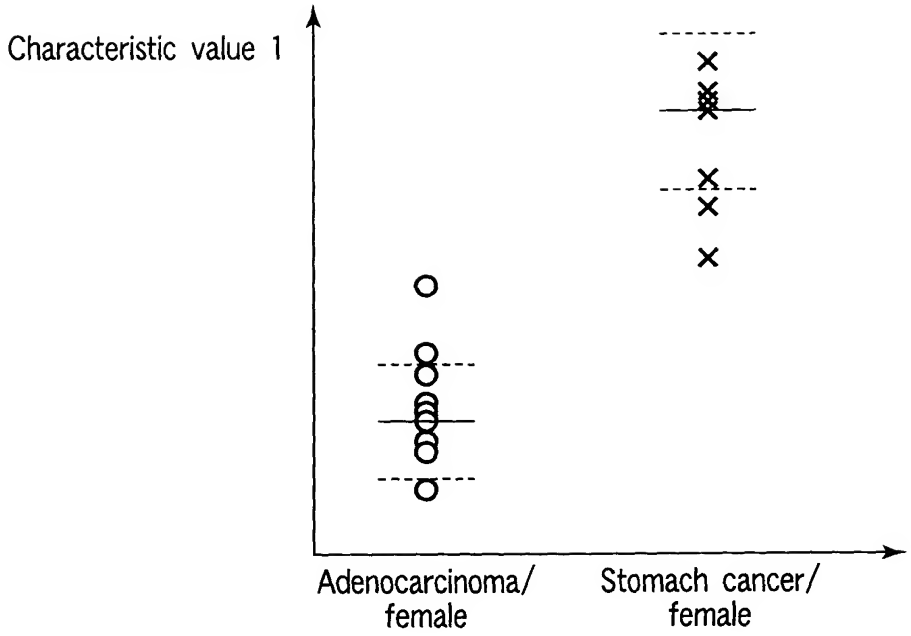

Characteristic value 1
Adenocarcinoma/
female
Stomach cancer/
female

FIG. 47

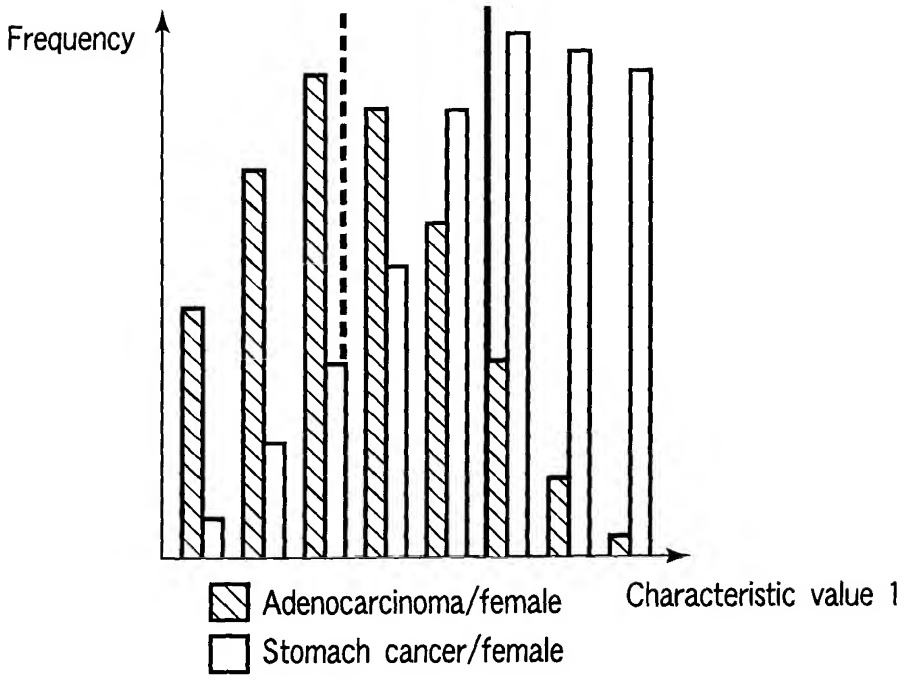

Frequency
Adenocarcinoma/female
Stomach cancer/female
Characteristic value 1

FIG. 48

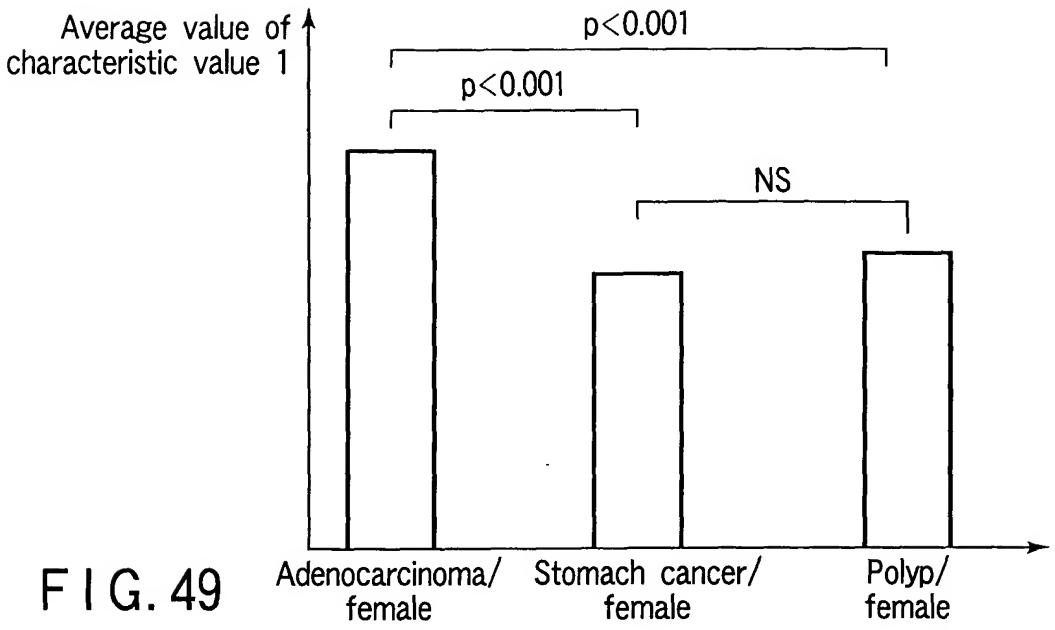


FIG. 49

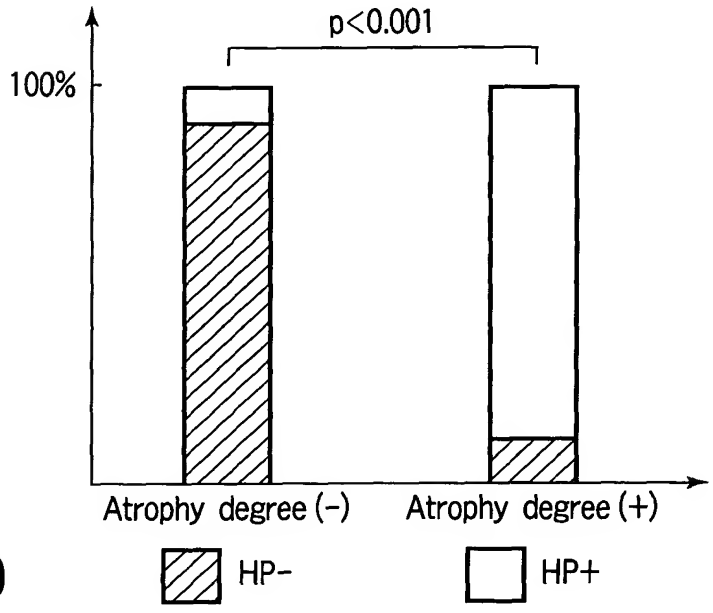


FIG. 50

Statistical information		
	Adenocarcinoma	Stomach cancer
Total	32	22
Patient age	50±15	70±5
Characteristic value 1	0.4±0.05	0.7±0.13
Characteristic value 3	1.5±0.08	1.7±0.01

FIG. 51

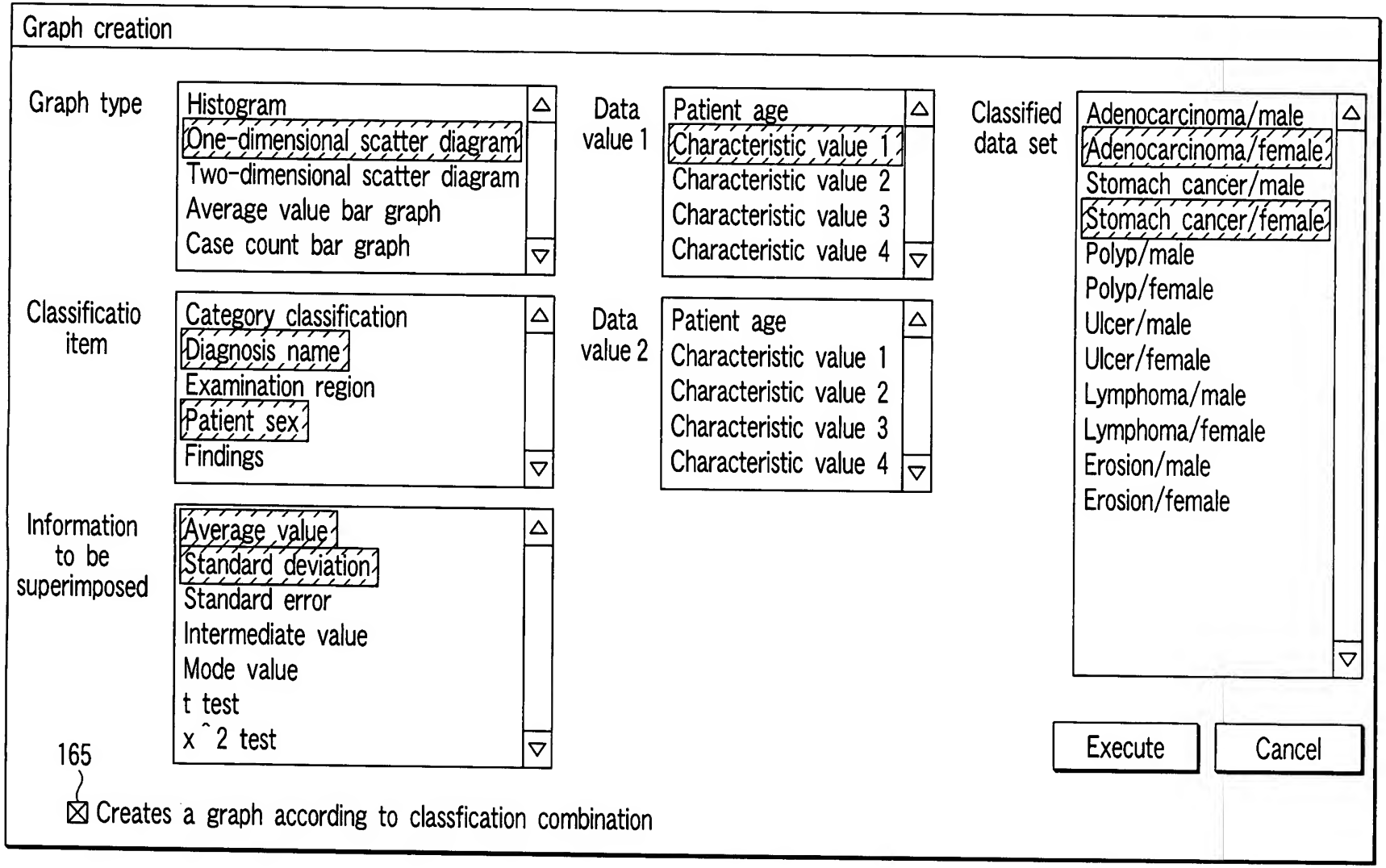

Graph creation
Graph type
Histogram
One-dimensional scatter diagram
Two-dimensional scatter diagram
Average value bar graph
Case count bar graph
Data value 1
Patient age
Characteristic value 1
Characteristic value 2
Characteristic value 3
Characteristic value 4
Classified data set
Adenocarcinoma/male
Adenocarcinoma/female
Stomach cancer/male
Stomach cancer/female
Polyp/male
Polyp/female
Ulcer/male
Ulcer/female
Lymphoma/male
Lymphoma/female
Erosion/male
Erosion/female
Classificatio item
Category classification
Diagnosis name
Examination region
Patient sex
Findings
Data value 2
Patient age
Characteristic value 1
Characteristic value 2
Characteristic value 3
Characteristic value 4
Information to be superimposed
Average value
Standard deviation
Standard error
Intermediate value
Mode value
t test
x ^ 2 test
Execute
Cancel
165
Creates a graph according to classfication combination

FIG. 52

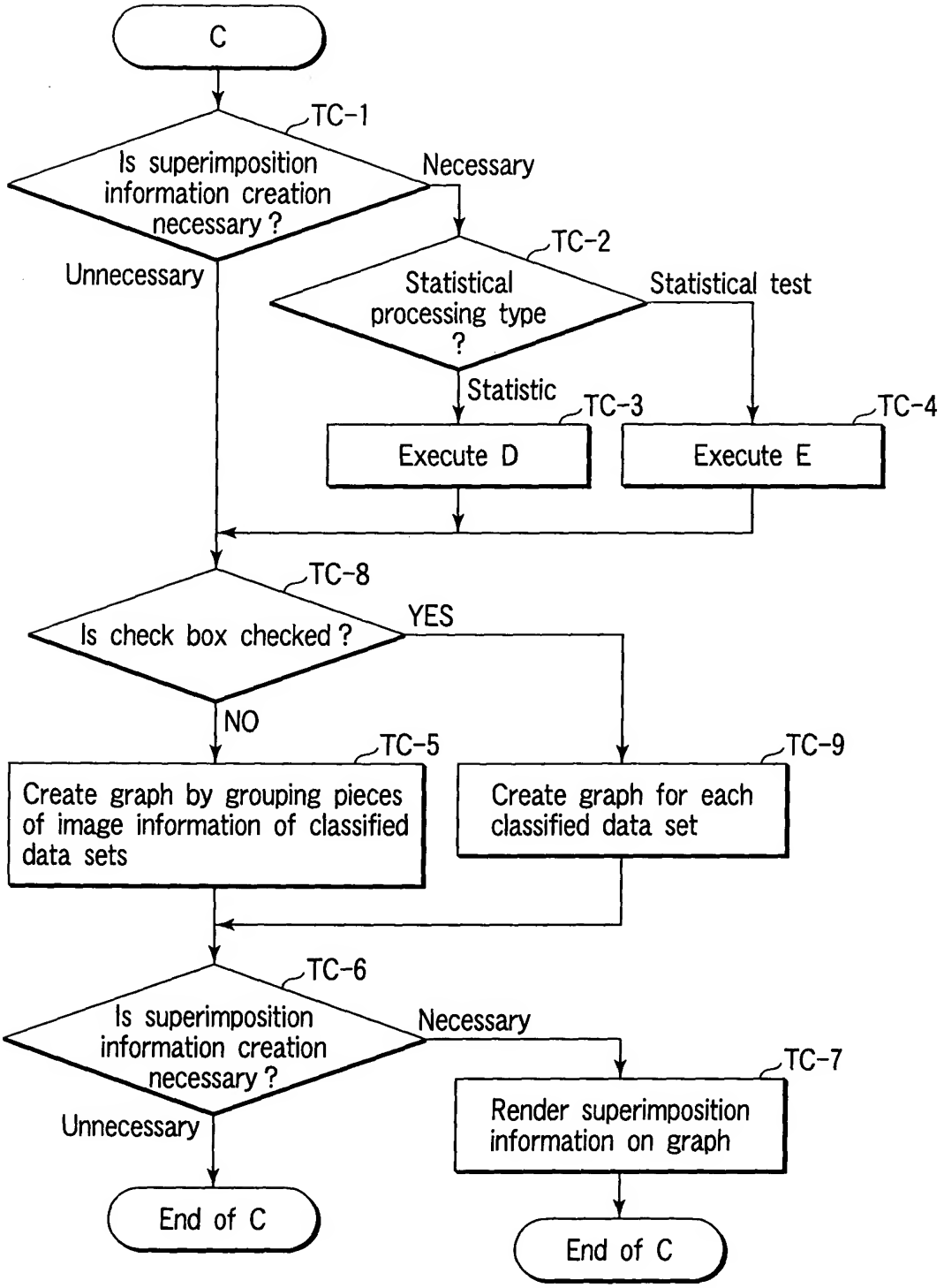

C
TC-1
Is superimposition information creation necessary ?
Necessary
Unnecessary
TC-2
Statistical processing type ?
Statistical test
Statistic
TC-3
Execute D
TC-4
Execute E
TC-8
Is check box checked ?
YES
NO
TC-5
Create graph by grouping pieces of image information of classified data sets
TC-9
Create graph for each classified data set
TC-6
Is superimposition information creation necessary ?
Necessary
Unnecessary
TC-7
Render superimposition information on graph
End of C
End of C

FIG. 53

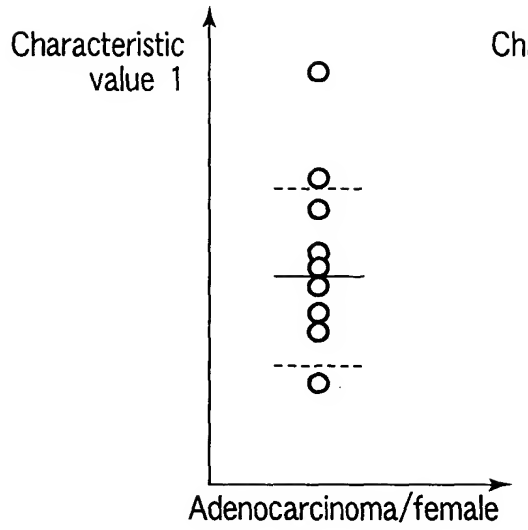


FIG. 54A

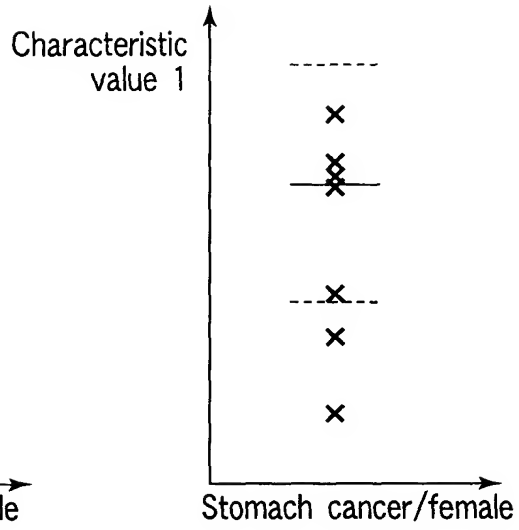


FIG. 54B

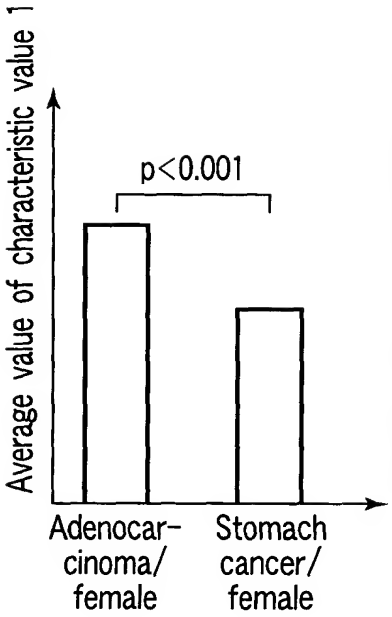


FIG. 55A

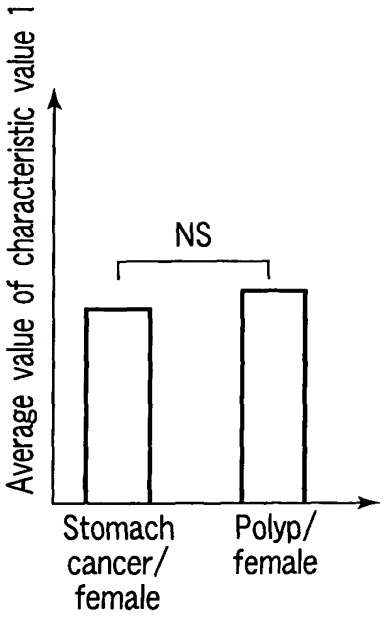


FIG. 55B

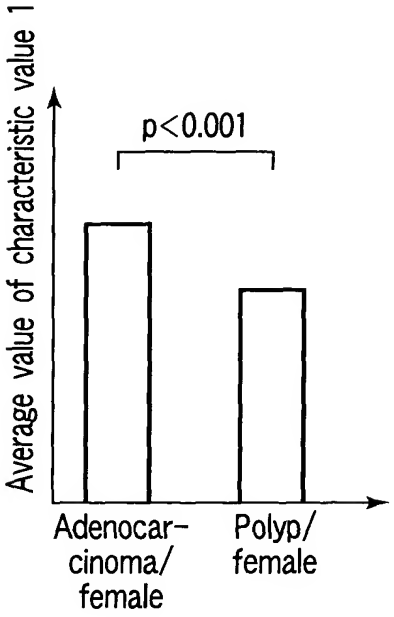


FIG. 55C

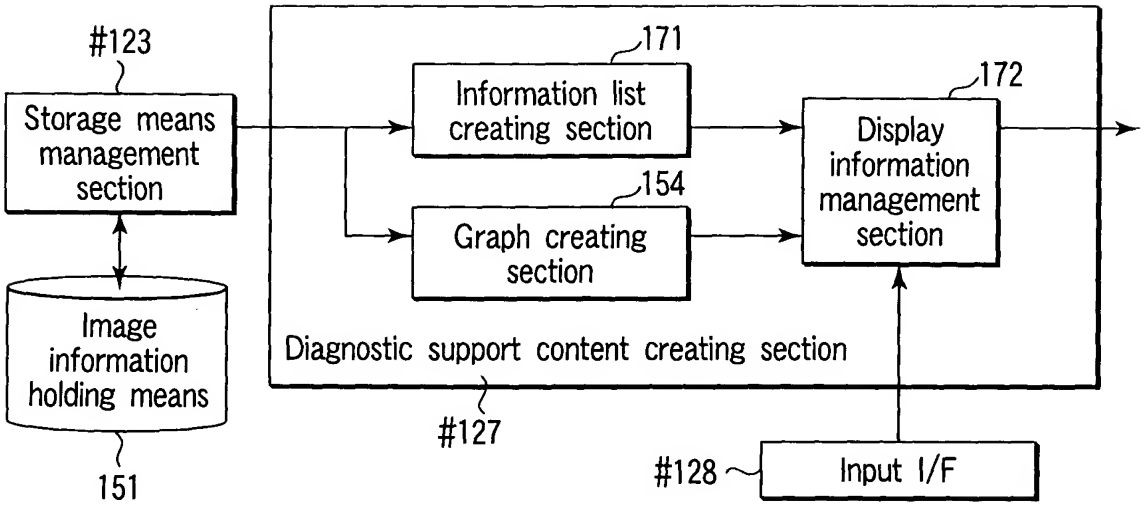

#123
Storage means management section
Image information holding means
151
171
Information list creating section
154
Graph creating section
172
Display information management section
Diagnostic support content creating section
#127
#128
Input I/F

FIG. 56

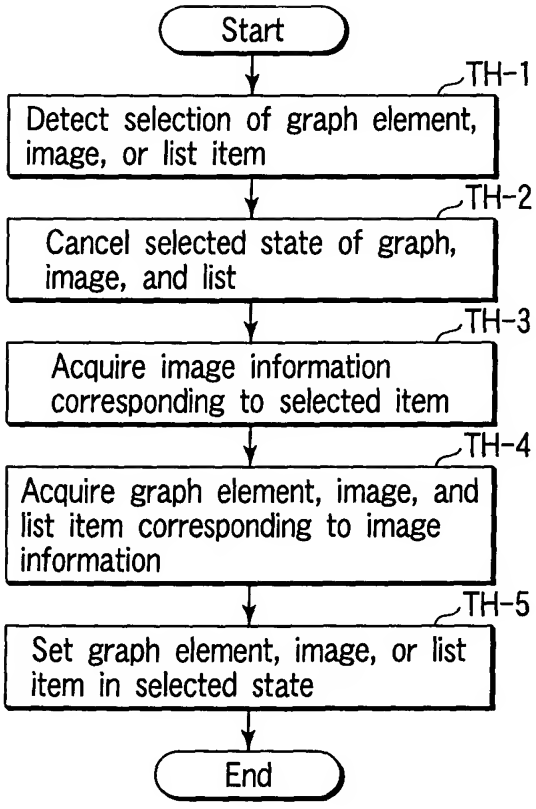

Start
TH-1
Detect selection of graph element, image, or list item
TH-2
Cancel selected state of graph, image, and list
TH-3
Acquire image information corresponding to selected item
TH-4
Acquire graph element, image, and list item corresponding to image information
TH-5
Set graph element, image, or list item in selected state
End

FIG. 57

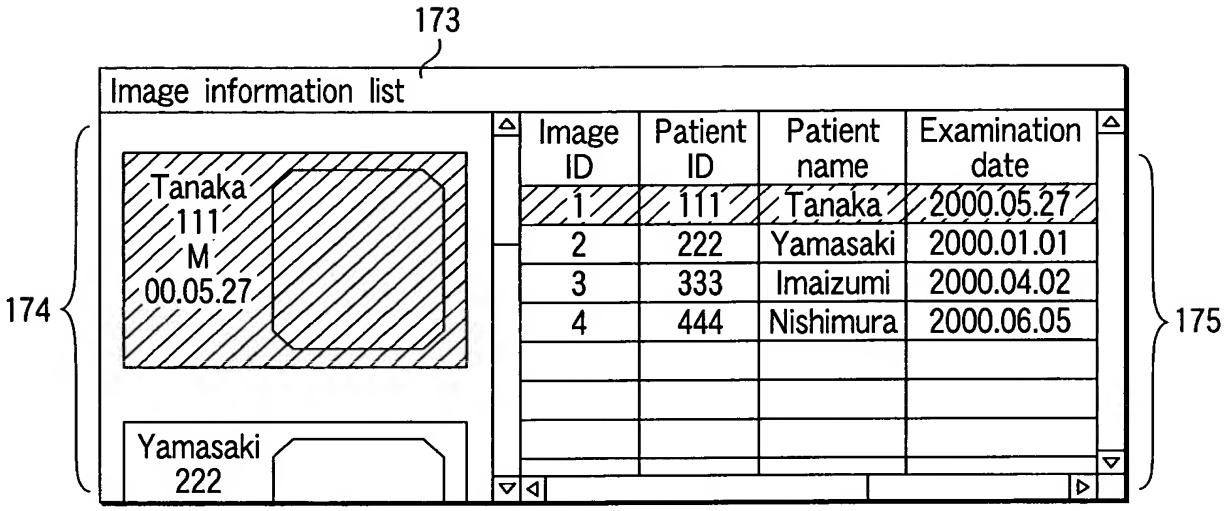

173
Image information list
Tanaka
111
M
00.05.27
Yamasaki
222
174
Image ID
Patient ID
Patient name
Examination date
1
111
Tanaka
2000.05.27
2
222
Yamasaki
2000.01.01
3
333
Imaizumi
2000.04.02
4
444
Nishimura
2000.06.05
175

FIG. 58

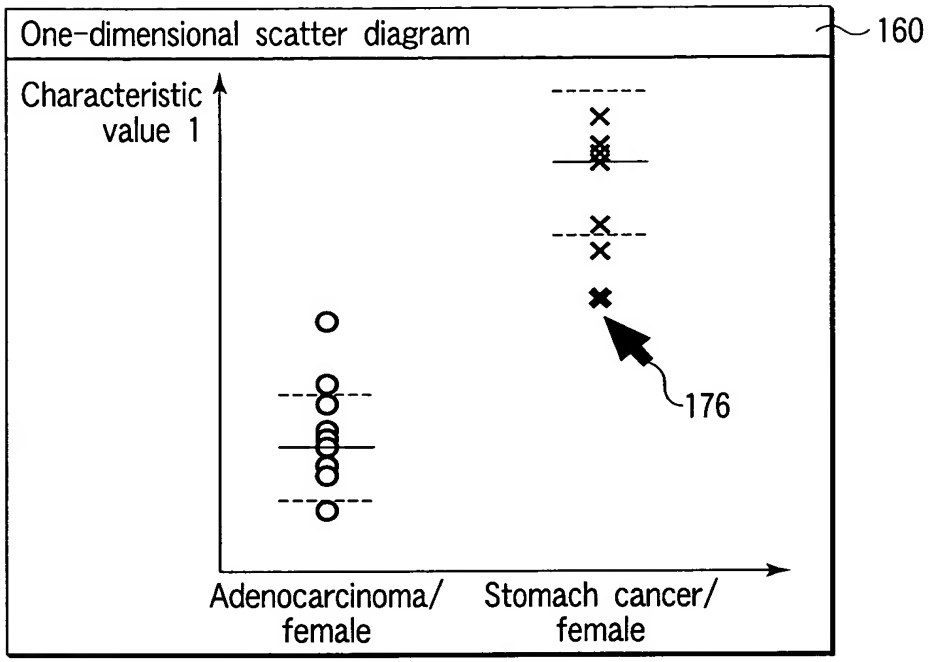

One-dimensional scatter diagram
160
Characteristic value 1
176
Adenocarcinoma/ female
Stomach cancer/ female

FIG. 59

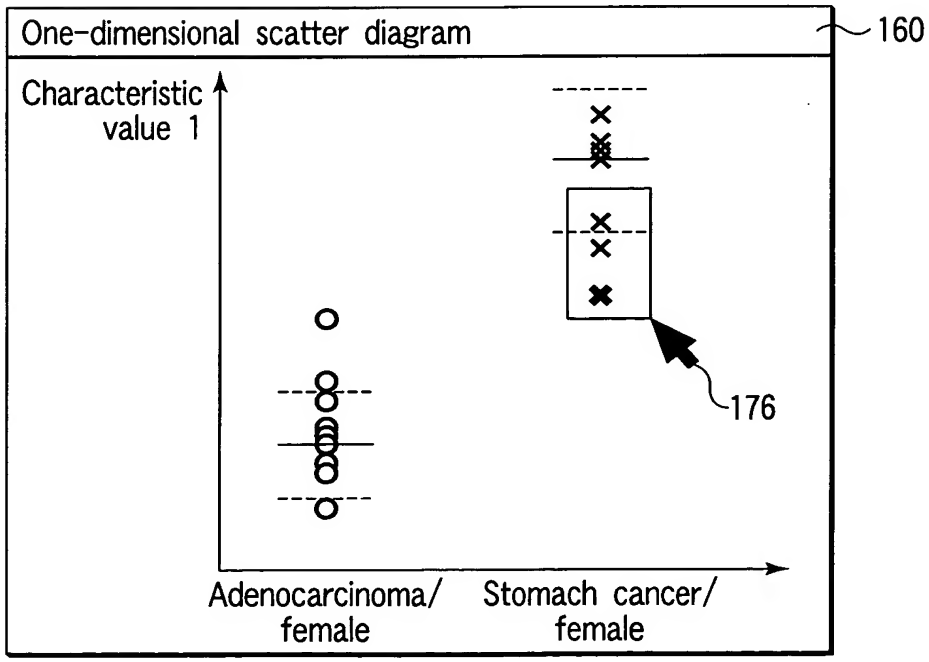

One-dimensional scatter diagram
160
Characteristic value 1
176
Adenocarcinoma/ female
Stomach cancer/ female

FIG. 60

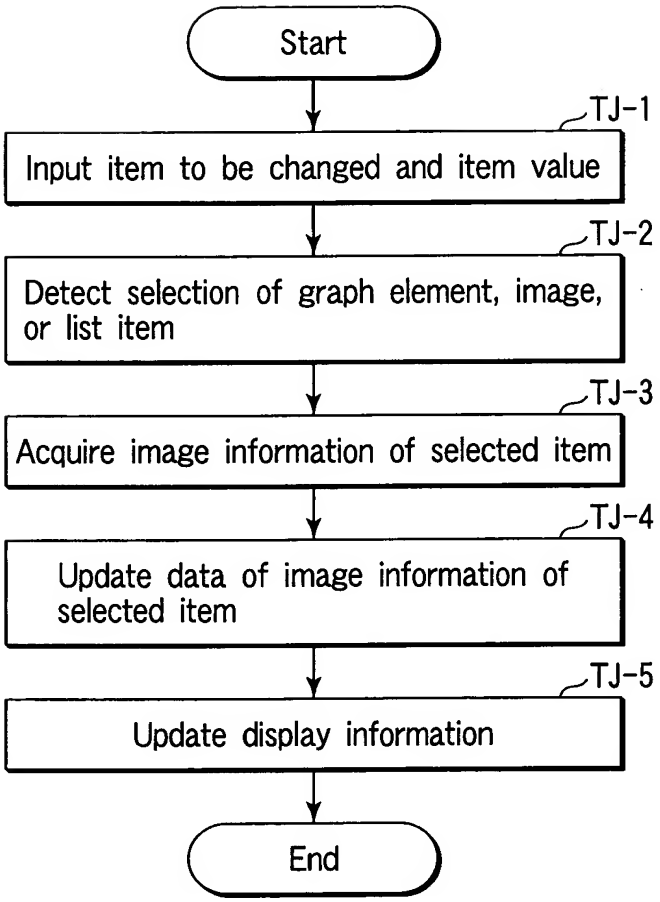

Start
TJ-1
Input item to be changed and item value
TJ-2
Detect selection of graph element, image, or list item
TJ-3
Acquire image information of selected item
TJ-4
Update data of image information of selected item
TJ-5
Update display information
End

FIG. 61

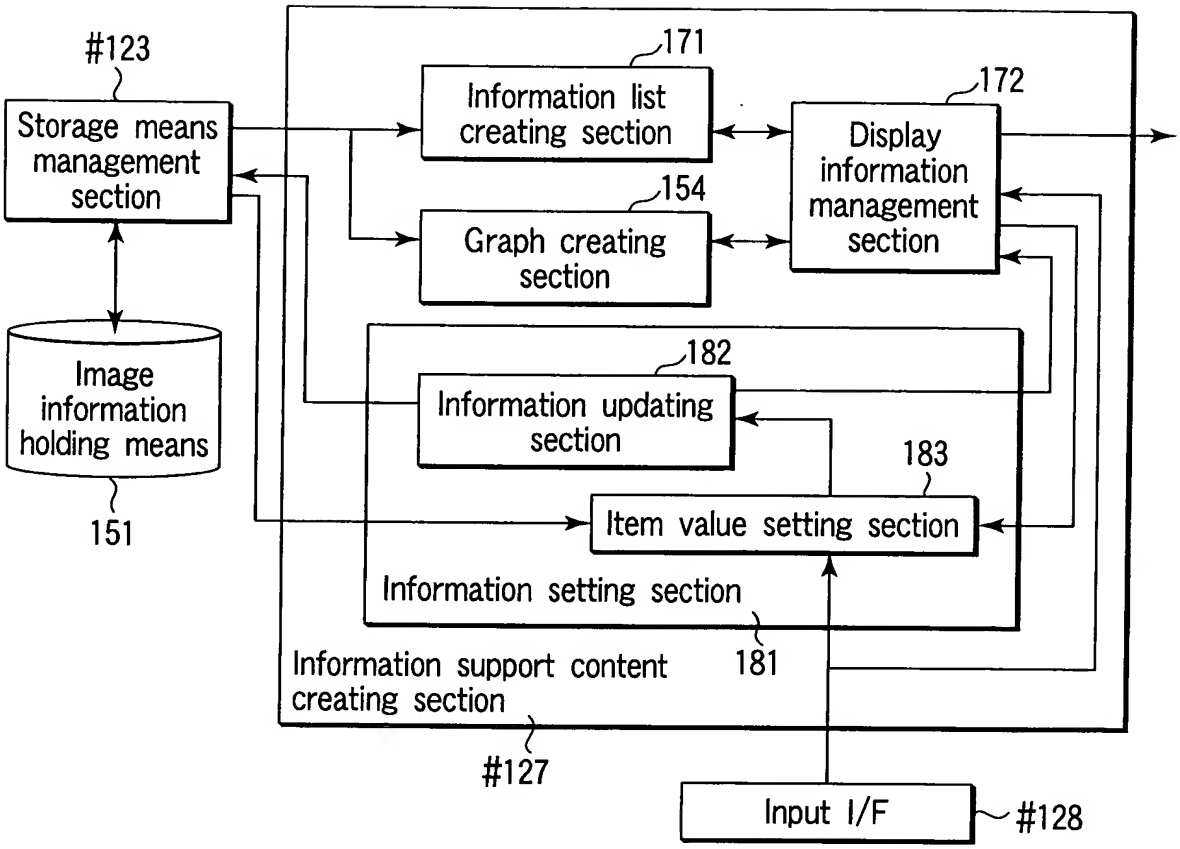

#123
Storage means management section
Image information holding means
151
171
Information list creating section
172
Display information management section
154
Graph creating section
182
Information updating section
183
Item value setting section
Information setting section
181
Information support content creating section
#127
Input I/F
#128

FIG. 62

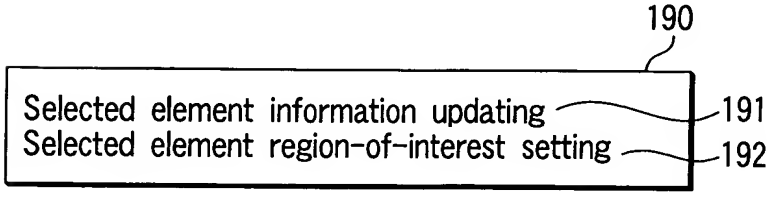

190
Selected element information updating
191
Selected element region-of-interest setting
192

FIG. 63

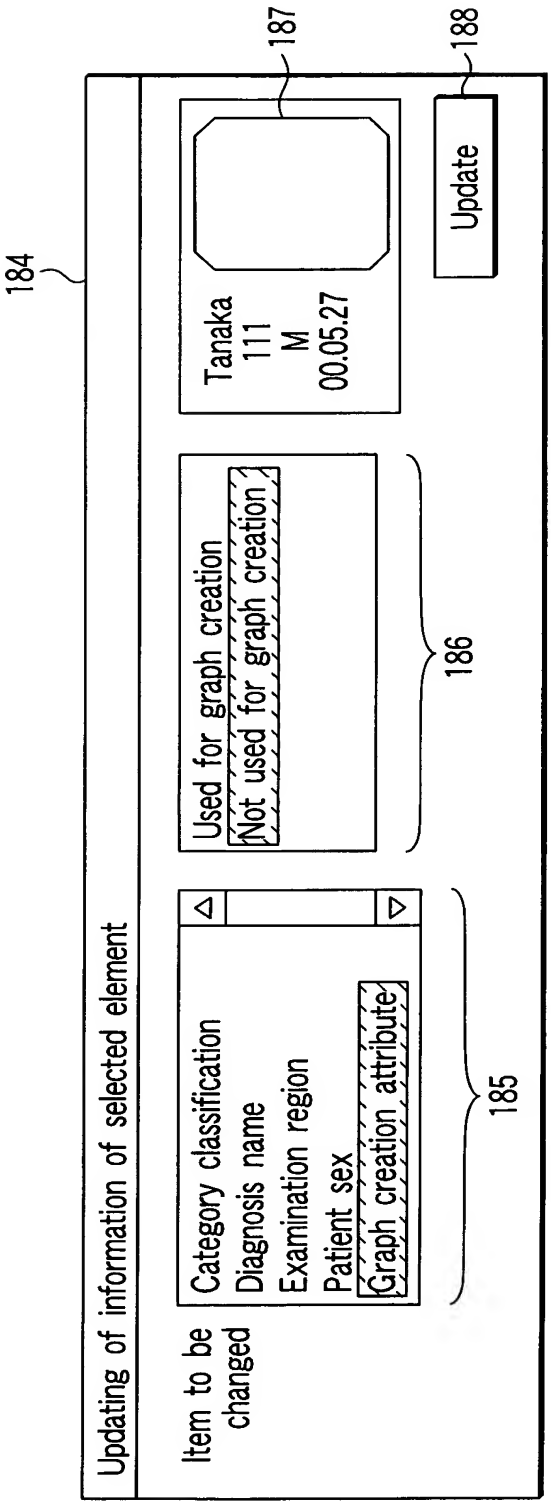

184
Updating of information of selected element
Item to be changed
Category classification
Diagnosis name
Examination region
Patient sex
Graph creation attribute
185
Used for graph creation
Not used for graph creation
186
Tanaka
111
M
00.05.27
187
Update
188

FIG. 64

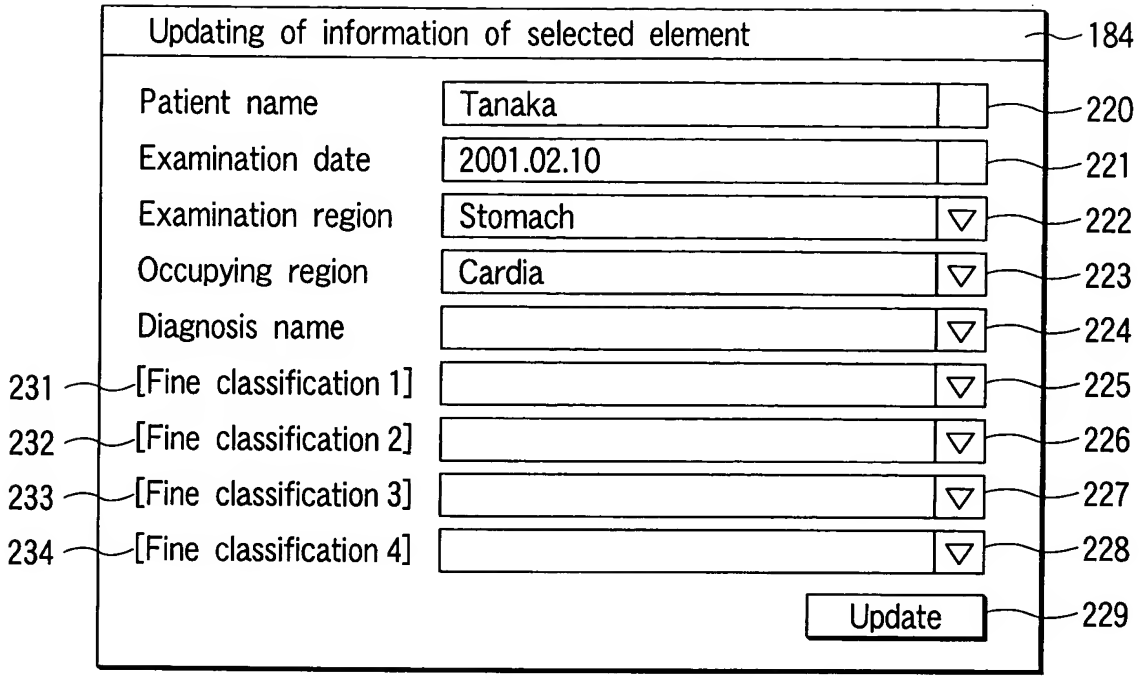

Updating of information of selected element
184
Patient name
Tanaka
220
Examination date
2001.02.10
221
Examination region
Stomach
222
Occupying region
Cardia
223
Diagnosis name
224
231
[Fine classification 1]
225
232
[Fine classification 2]
226
233
[Fine classification 3]
227
234
[Fine classification 4]
228
Update
229

FIG. 65

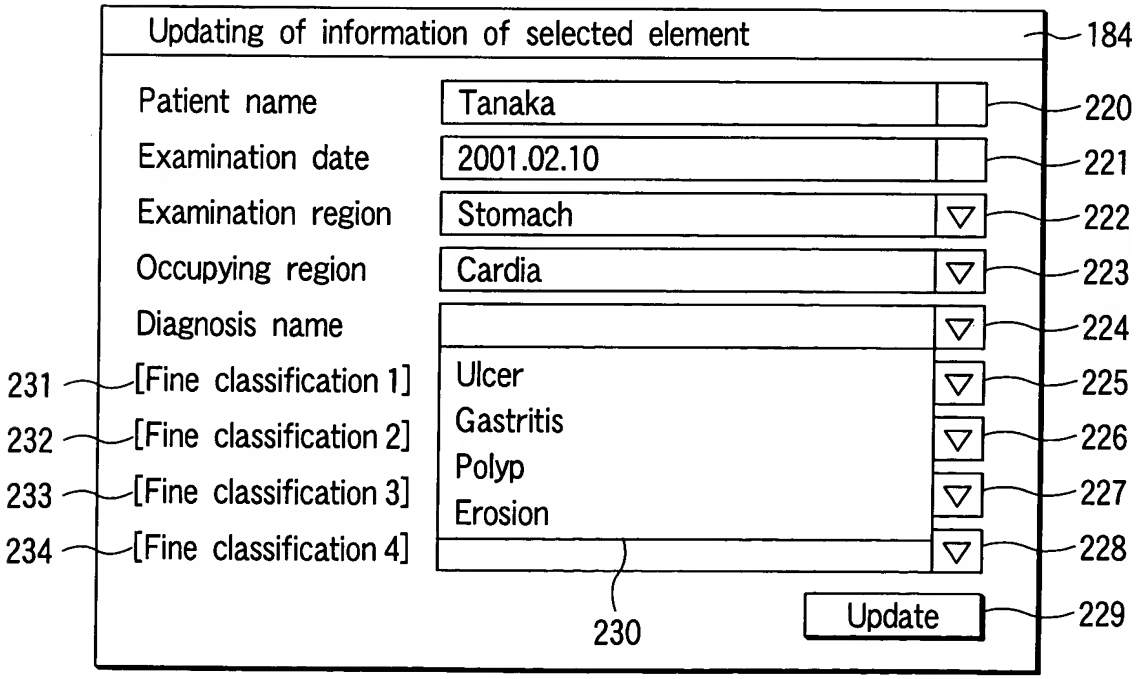

Updating of information of selected element
184
Patient name
Tanaka
220
Examination date
2001.02.10
221
Examination region
Stomach
222
Occupying region
Cardia
223
Diagnosis name
224
231
[Fine classification 1]
Ulcer
225
232
[Fine classification 2]
Gastritis
226
233
[Fine classification 3]
Polyp
227
234
[Fine classification 4]
Erosion
228
230
Update
229

FIG. 66

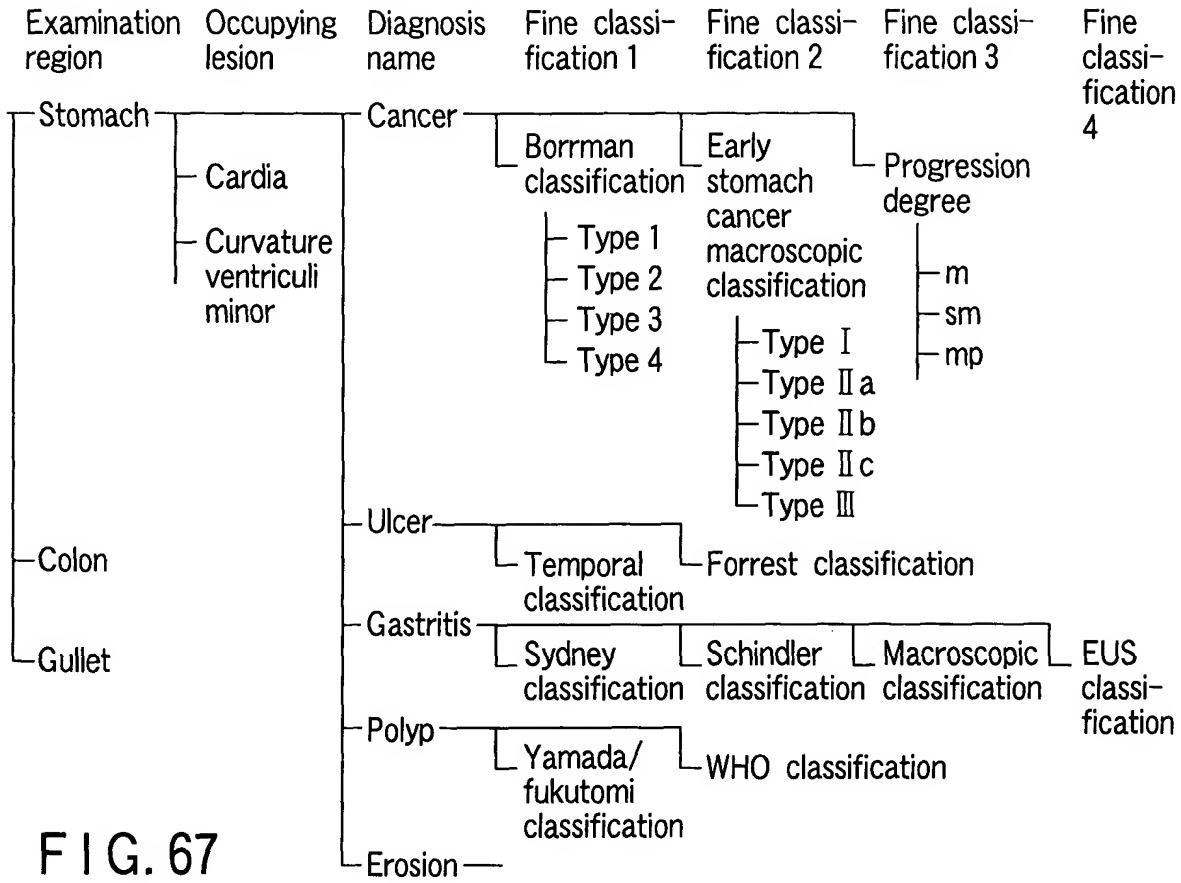

Examination region
Occupying lesion
Diagnosis name
Fine classification 1
Fine classification 2
Fine classification 3
Fine classification 4
Stomach
Cardia
Curvature ventriculi minor
Colon
Gullet
Cancer
Borrman classification
Type 1
Type 2
Type 3
Type 4
Early stomach cancer macroscopic classification
Type I
Type IIa
Type IIb
Type IIc
Type III
Progression degree
m
sm
mp
Ulcer
Temporal classification
Forrest classification
Gastritis
Sydney classification
Schindler classification
Macroscopic classification
EUS classification
Polyp
Yamada/ fukutomi classification
WHO classification
Erosion

FIG. 67

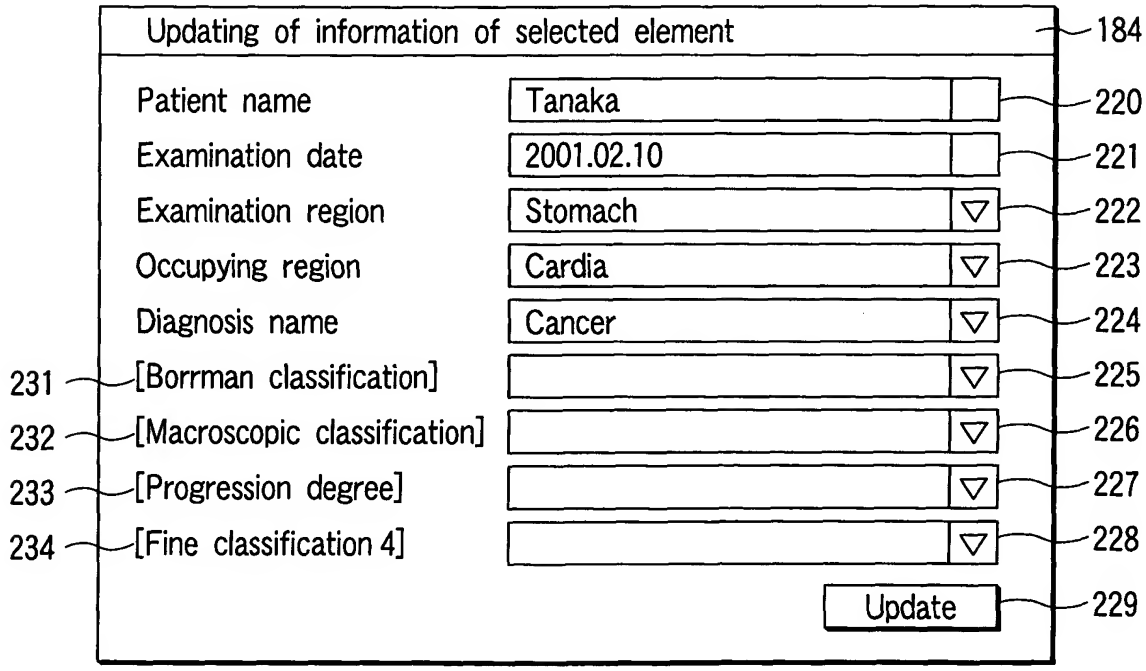

Updating of information of selected element
184
Patient name
Tanaka
220
Examination date
2001.02.10
221
Examination region
Stomach
222
Occupying region
Cardia
223
Diagnosis name
Cancer
224
231
[Borrman classification]
225
232
[Macroscopic classification]
226
233
[Progression degree]
227
234
[Fine classification 4]
228
Update
229

FIG. 68

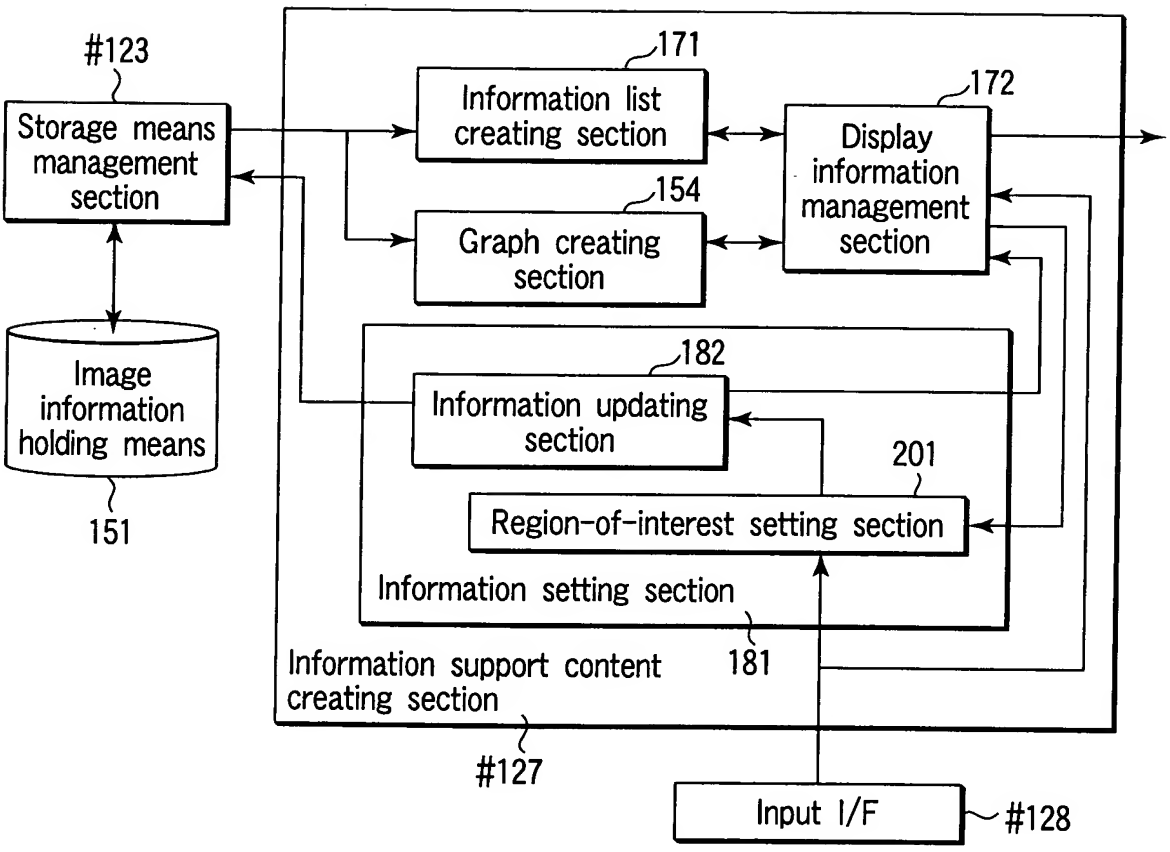

#123
Storage means management section
Image information holding means
151
171
Information list creating section
172
Display information management section
154
Graph creating section
182
Information updating section
201
Region-of-interest setting section
Information setting section
181
Information support content creating section
#127
Input I/F
#128

FIG. 69

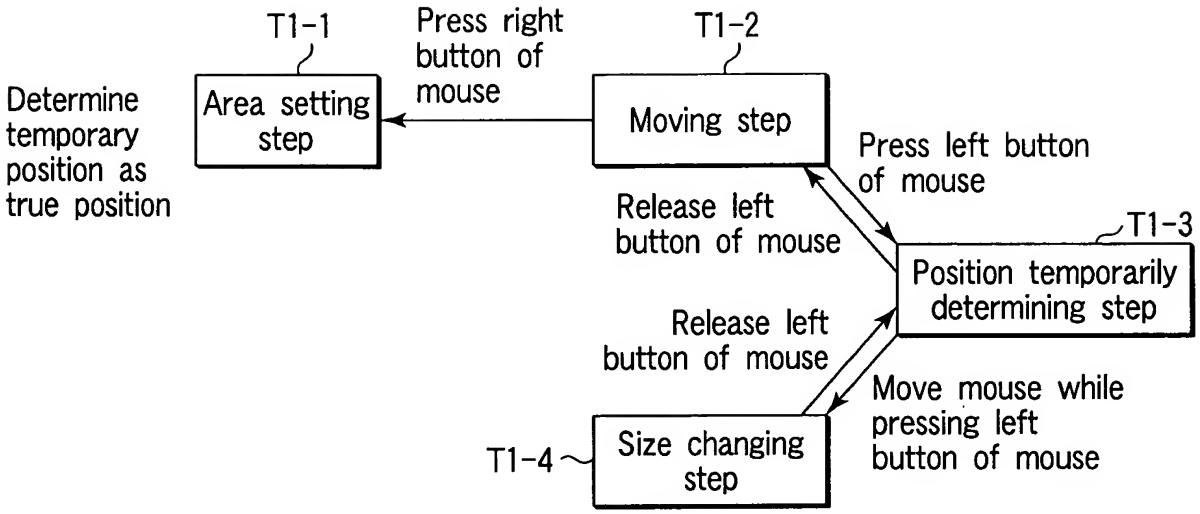

T1-1
Press right button of mouse
T1-2
Determine temporary position as true position
Area setting step
Moving step
Press left button of mouse
Release left button of mouse
T1-3
Position temporarily determining step
Release left button of mouse
Move mouse while pressing left button of mouse
T1-4
Size changing step

FIG. 70

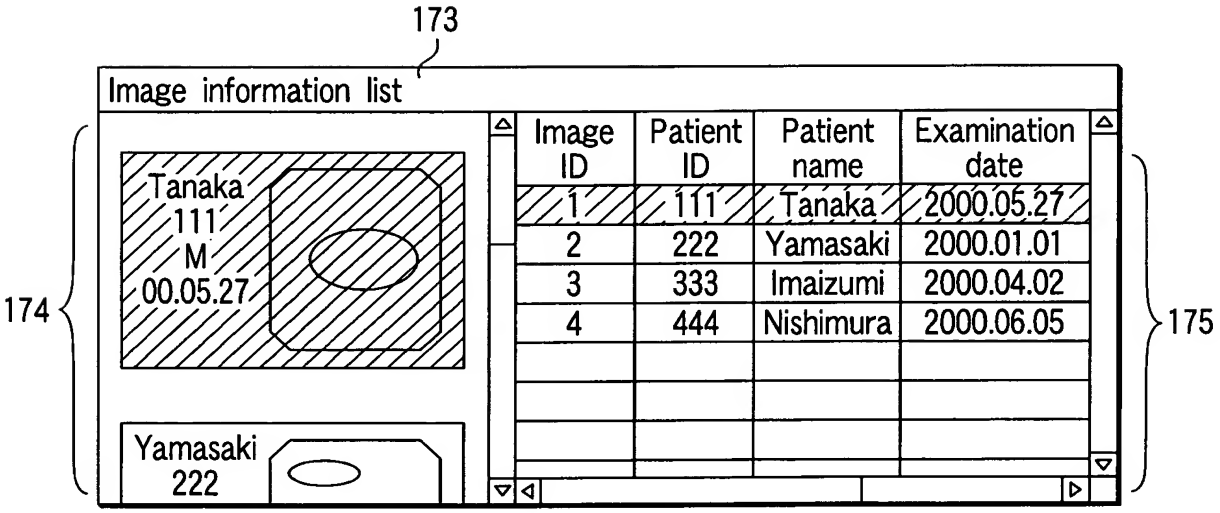

173
Image information list
174
Tanaka
111
M
00.05.27
Yamasaki
222
Image ID
Patient ID
Patient name
Examination date
1
111
Tanaka
2000.05.27
2
222
Yamasaki
2000.01.01
3
333
Imaizumi
2000.04.02
4
444
Nishimura
2000.06.05
175

FIG. 71

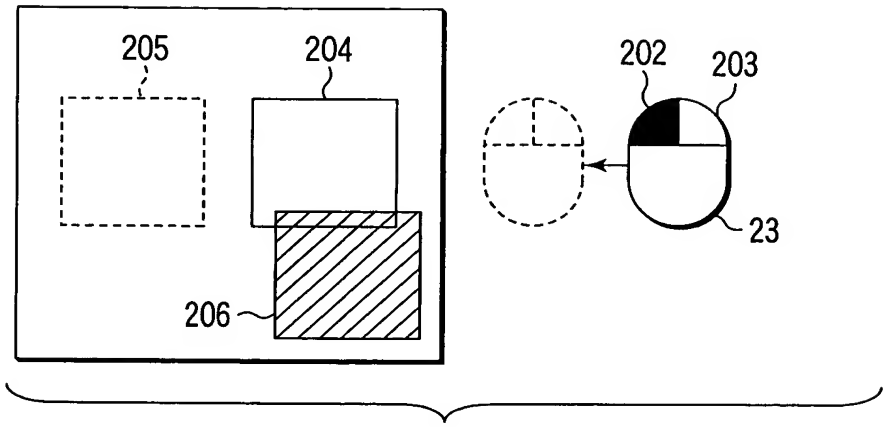


FIG. 72A

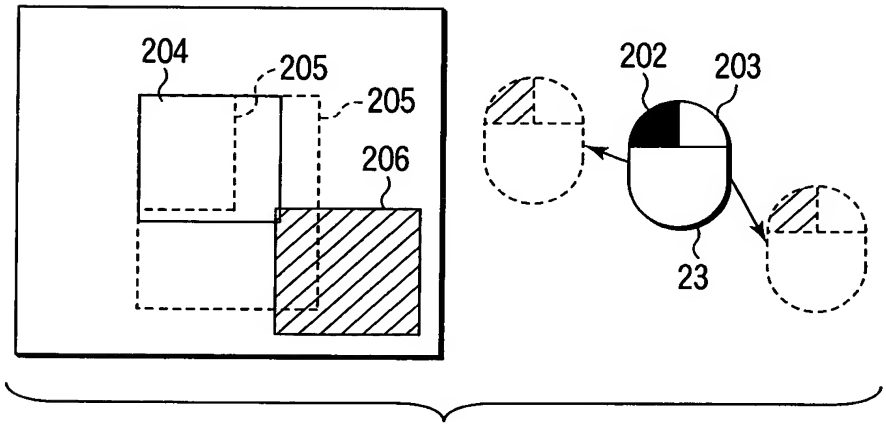


FIG. 72B

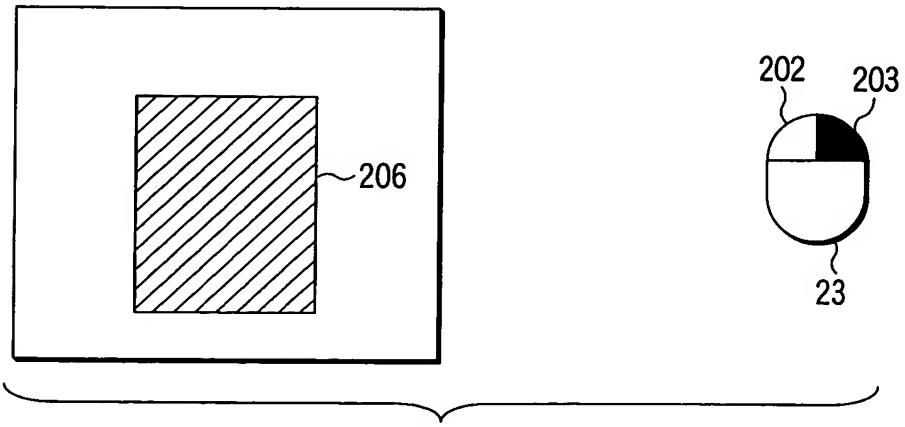


FIG. 72C

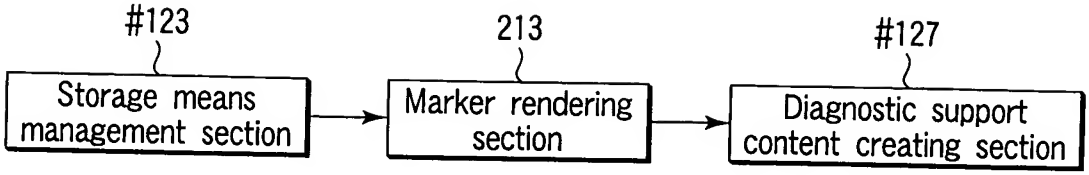


FIG. 73

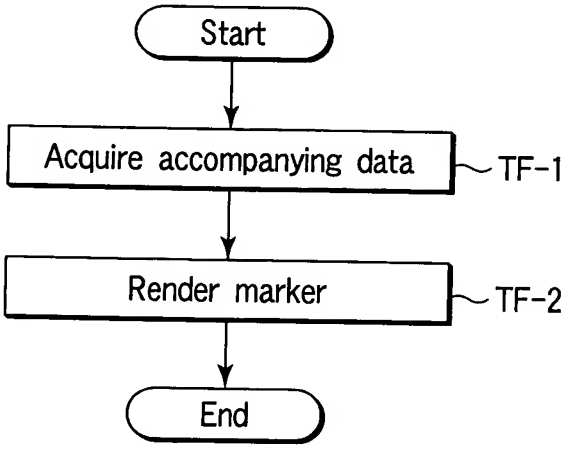


FIG. 74

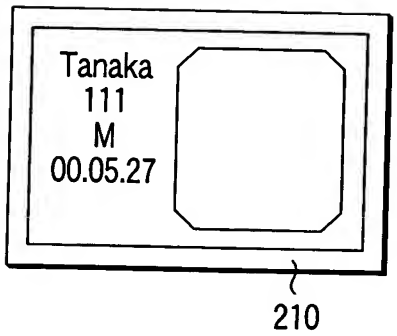


FIG. 75A

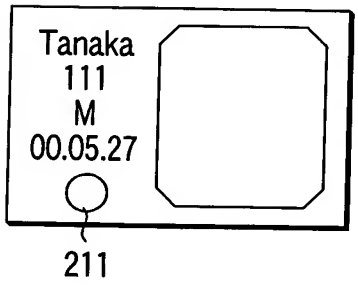


FIG. 75B

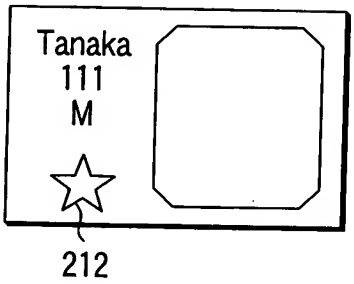


FIG. 75C

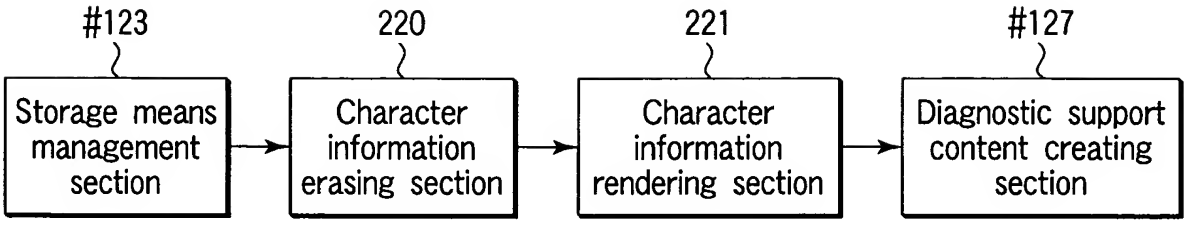


FIG. 76

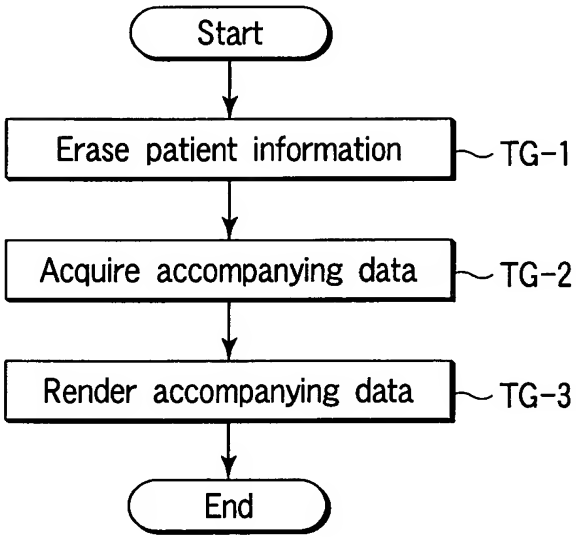


FIG. 77

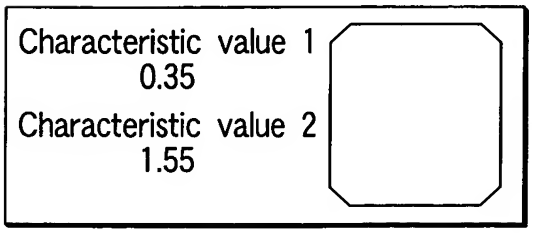


FIG. 78

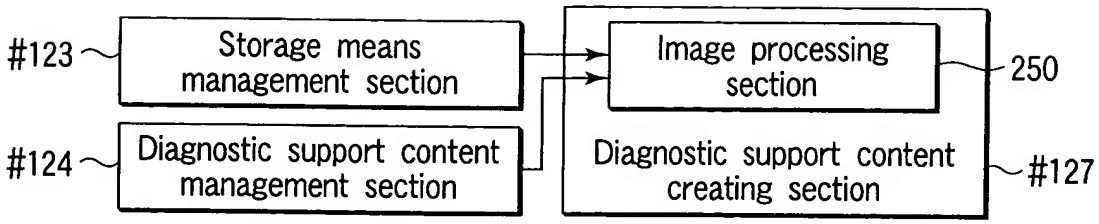


FIG. 79

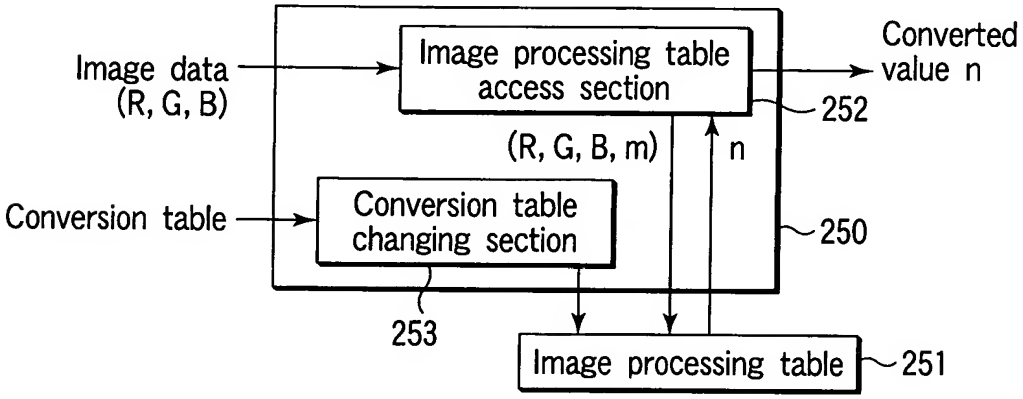


FIG. 80

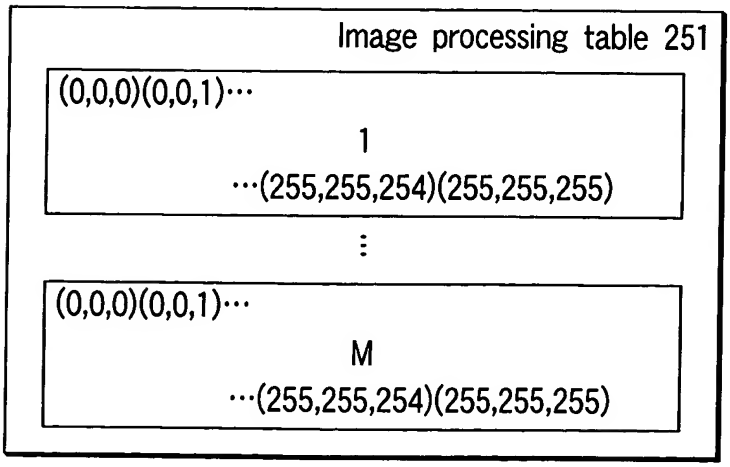


FIG. 81

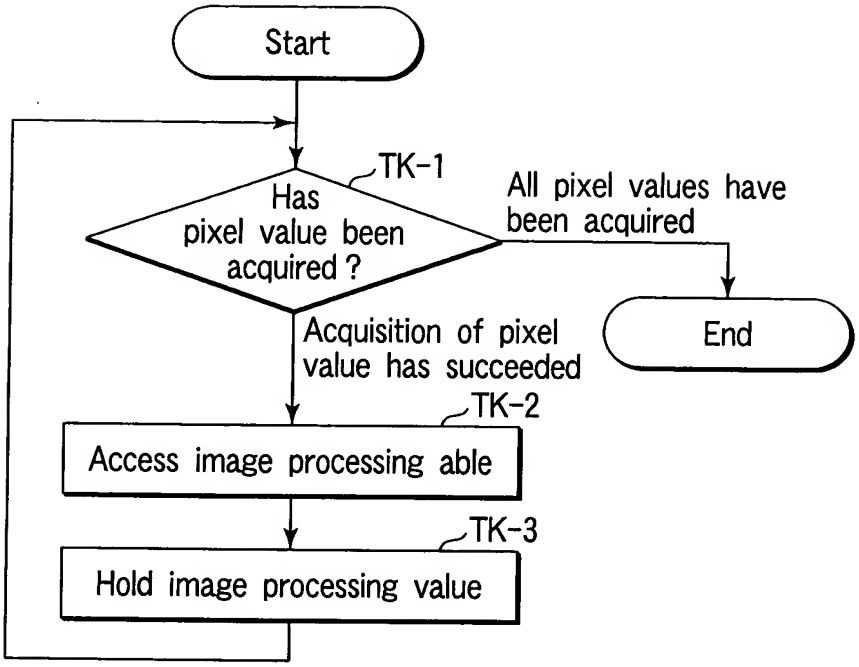

Start
TK-1
Has pixel value been acquired ?
All pixel values have been acquired
End
Acquisition of pixel value has succeeded
TK-2
Access image processing able
TK-3
Hold image processing value

FIG. 82

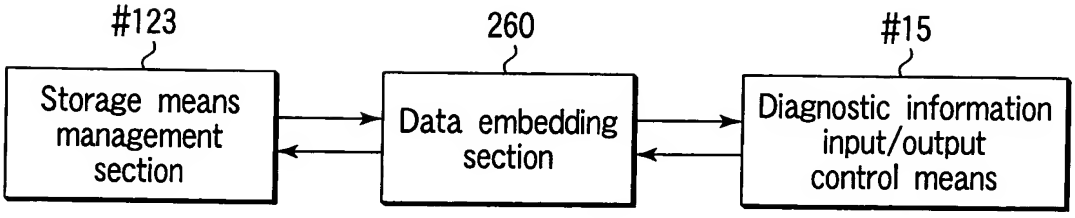

#123
Storage means management section
260
Data embedding section
#15
Diagnostic information input/output control means

FIG. 83

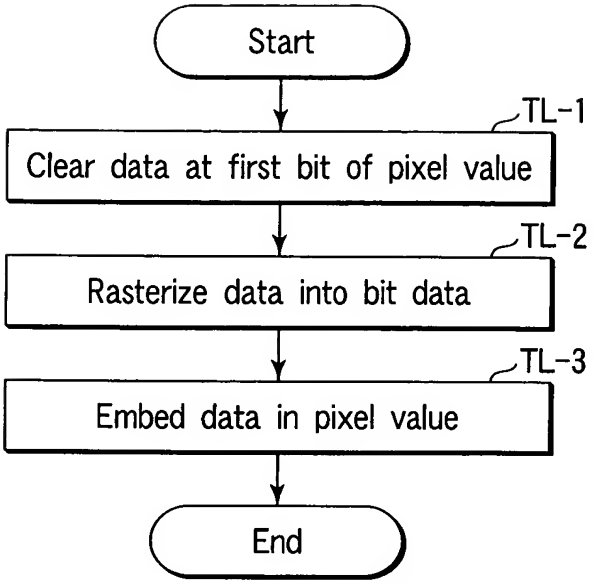


FIG. 84A

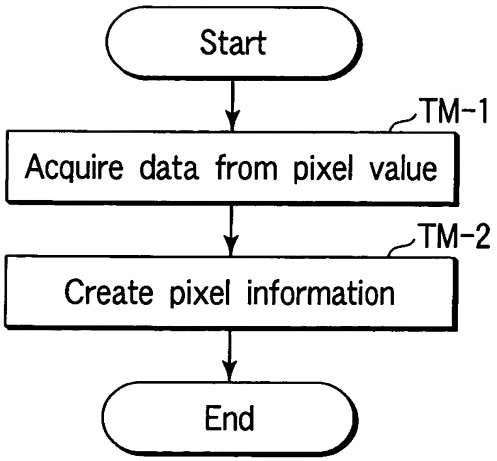


FIG. 84B

FIG. 85

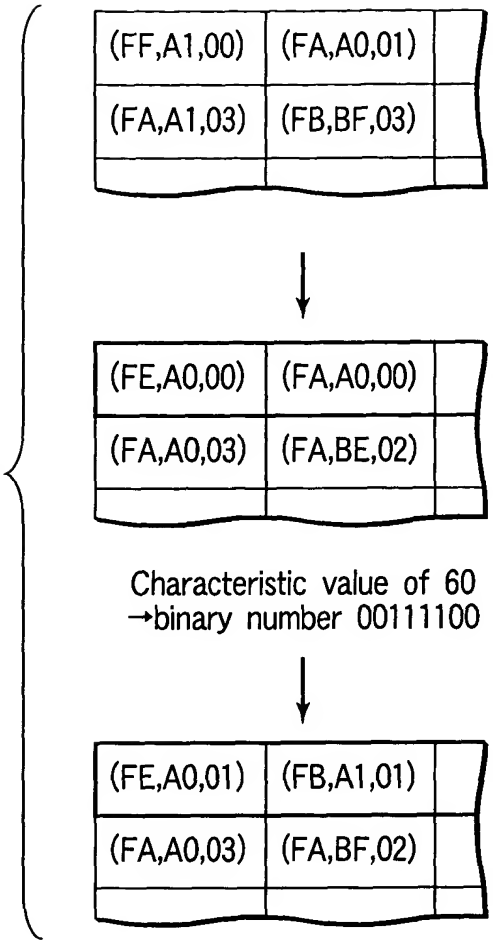
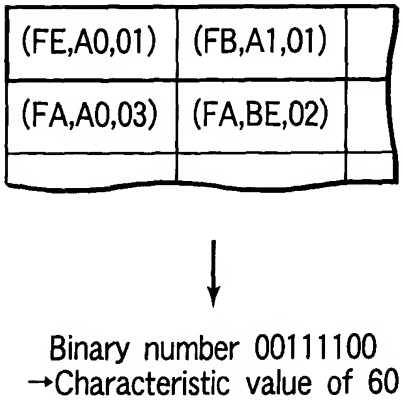

(FF,A1,00)
(FA,A0,01)
(FA,A1,03)
(FB,BF,03)
(FE,A0,00)
(FA,A0,00)
(FA,A0,03)
(FA,BE,02)
Characteristic value of 60
→binary number 00111100
(FE,A0,01)
(FB,A1,01)
(FA,A0,03)
(FA,BF,02)

FIG. 86


(FE,A0,01)
(FB,A1,01)
(FA,A0,03)
(FA,BE,02)
Binary number 00111100
→Characteristic value of 60

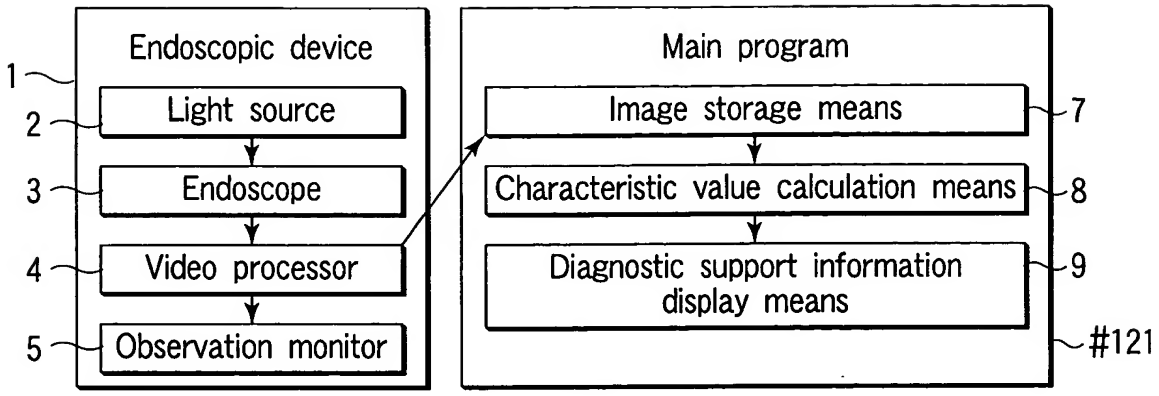


FIG. 87

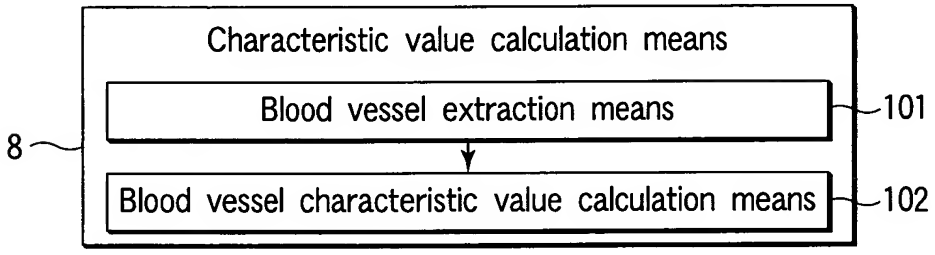


FIG. 88

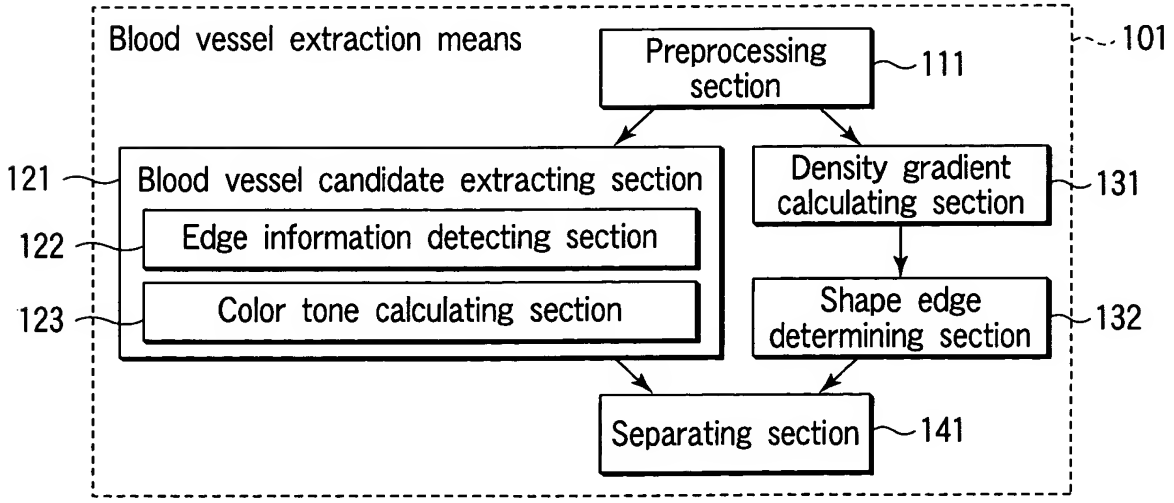


FIG. 89

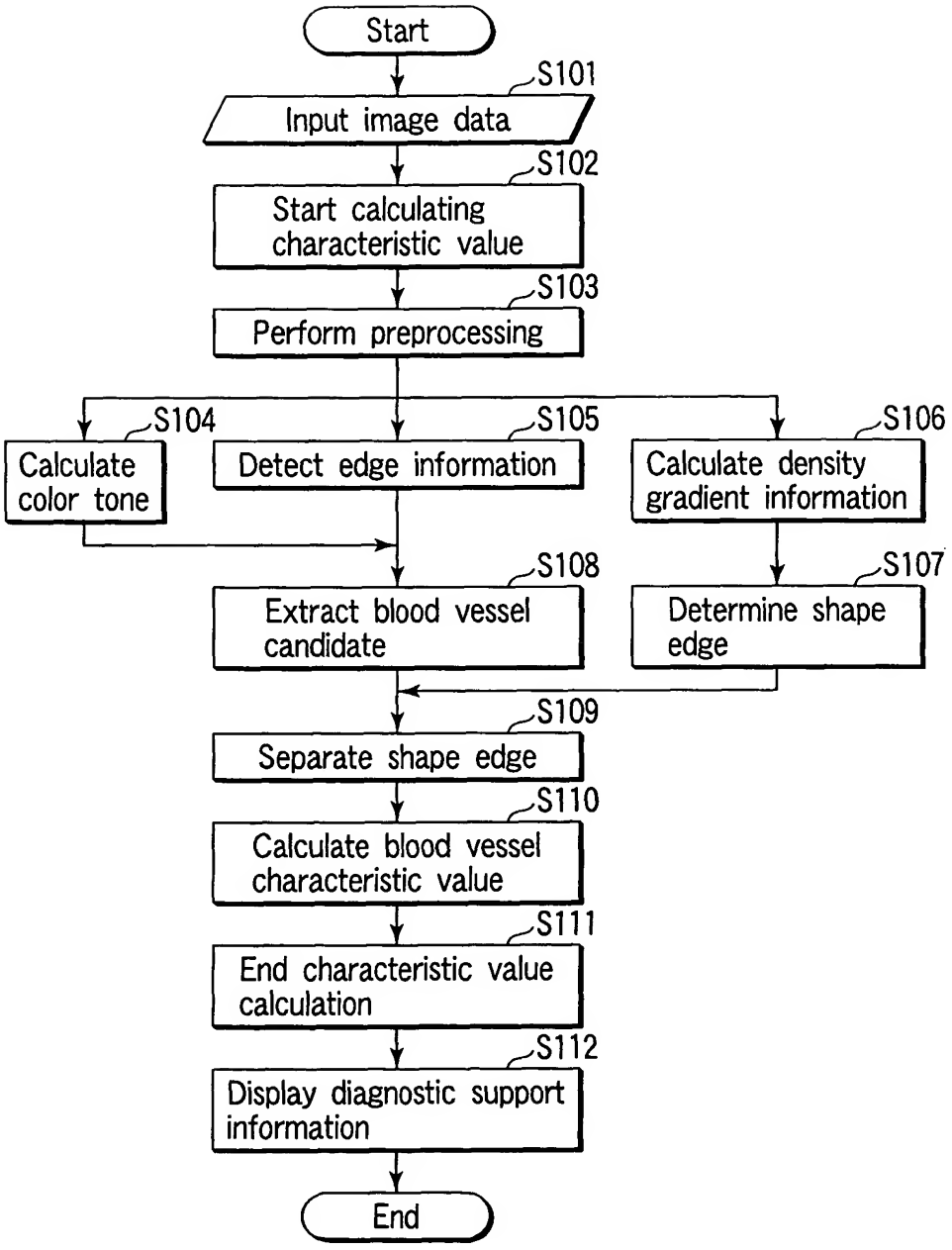

Start
S101
Input image data
S102
Start calculating characteristic value
S103
Perform preprocessing
S104
Calculate color tone
S105
Detect edge information
S106
Calculate density gradient information
S108
Extract blood vessel candidate
S107
Determine shape edge
S109
Separate shape edge
S110
Calculate blood vessel characteristic value
S111
End characteristic value calculation
S112
Display diagnostic support information
End

FIG. 90

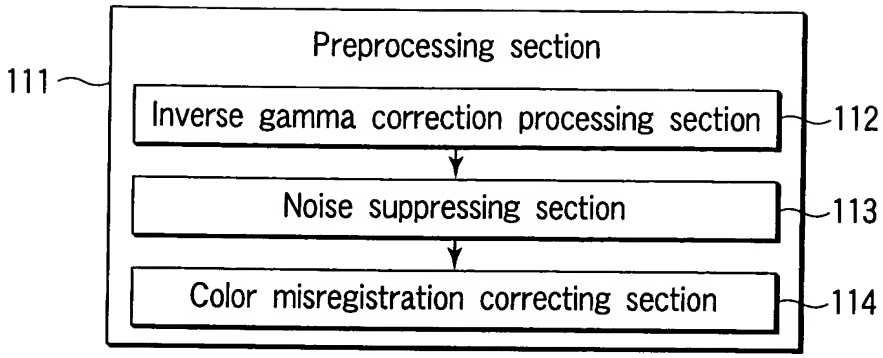


FIG. 91

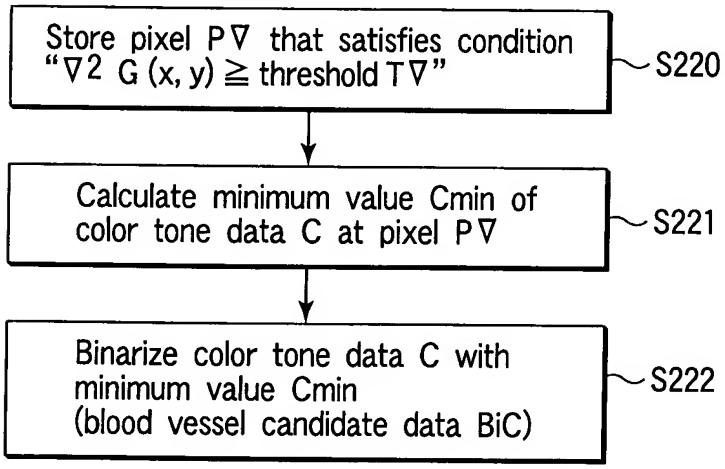


FIG. 92

0	1	0
1	-4	1
0	1	0

FIG. 93

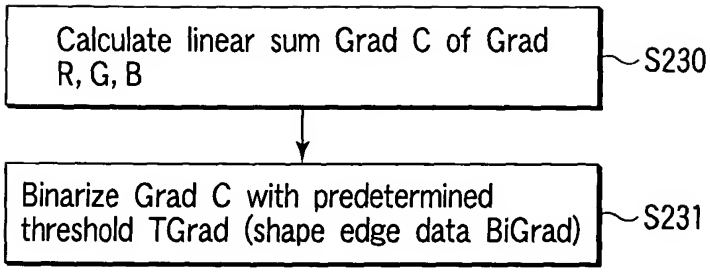

Calculate linear sum Grad C of Grad R, G, B
S230
Binarize Grad C with predetermined threshold TGrad (shape edge data BiGrad)
S231

FIG. 94

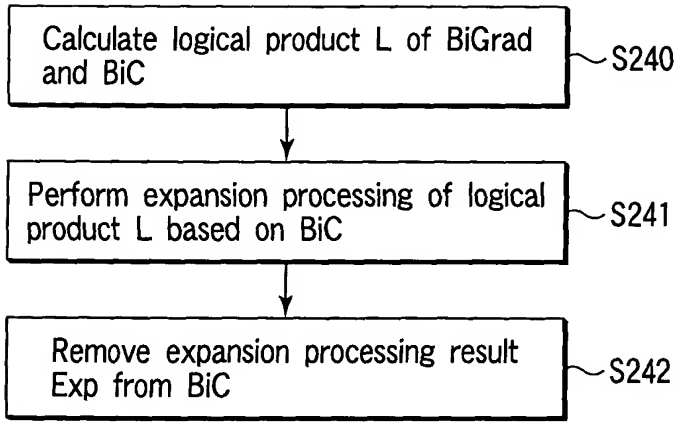

Calculate logical product L of BiGrad and BiC
S240
Perform expansion processing of logical product L based on BiC
S241
Remove expansion processing result Exp from BiC
S242

FIG. 95

FIG. 96

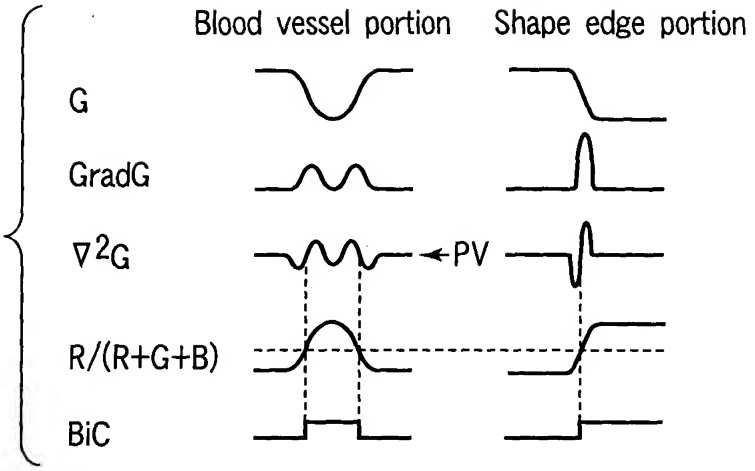


FIG. 97

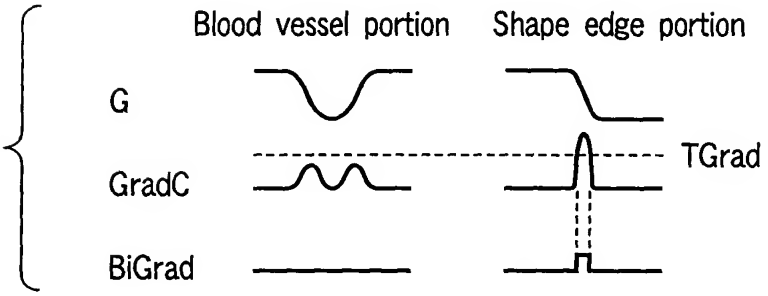
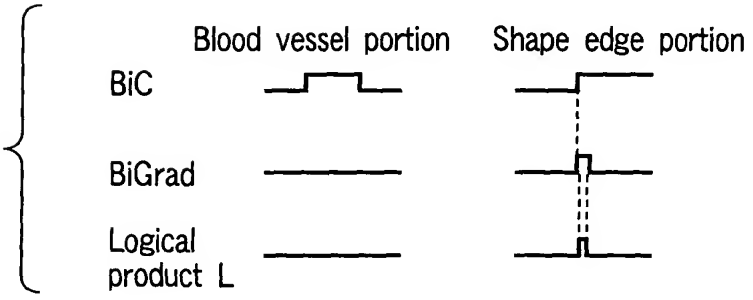



FIG. 98